United States Patent [19]

Turnheim et al.

[11] **3,802,715**

[45] **Apr. 9, 1974**

[54] **SKI BINDING PART**

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[30] **Foreign Application Priority Data**

Mar. 8, 1971 Austria 1999/71

[52] **U.S. Cl.** ..... **280/11.35 M,** 338/44, 338/46, 338/94, 338/156

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

[58] **Field of Search** 280/11.35 M, 11.35 T, 11.35 R; 338/44, 94, 156, 151, 43, 46

[56] **References Cited**

UNITED STATES PATENTS

3,367,672	2/1968	Tonozzi et al.	280/11.35 M
3,246,907	4/1966	Chisholm	280/11.35 M
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Primary Examiner—David Schonberg
Assistant Examiner—Milton L. Smith
Attorney, Agent, or Firm—Woodhams, Blanchard and Flynn

[57] **ABSTRACT**

Safety release ski bindings with slope responsive means for adjusting release tension. Safety release ski bindings are provided which are held in normally closed position by the action of an electromagnet. Slope responsive means are connected in circuit with said electromagnet and a power source to continuously alter the strength of the electromagnet in response to the slope of the ski whereby a lesser force would be required to open the safety binding when the ski is on a relatively gentle slope and a greater force would be required to open same when the ski is on a steeper slope. Various kinds of slope responsive devices are suggested such as an electrically conductive liquid medium capable of shorting out certain wires of a rheostat, a pendulumlike armature for a rheostat which responds to gravity for variable contact with the wires thereof or motor driven gyroscopic means for altering the contact of a rheostat armature with the resistance wires thereof.

9 Claims, 10 Drawing Figures

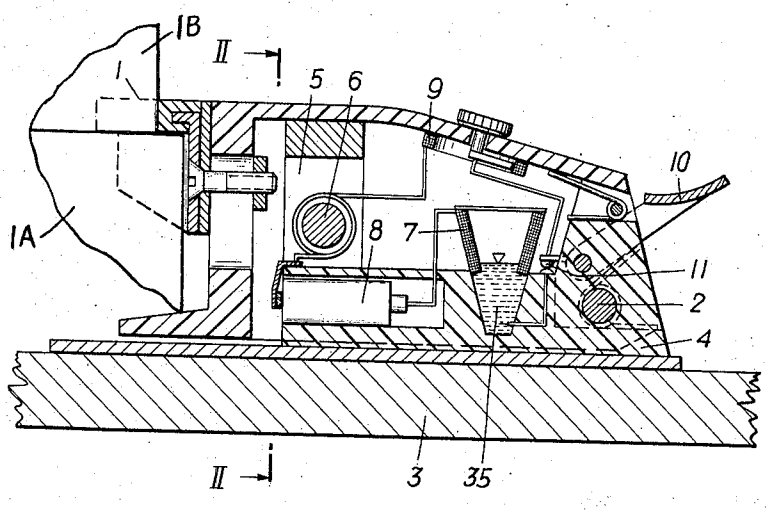


FIG. 1

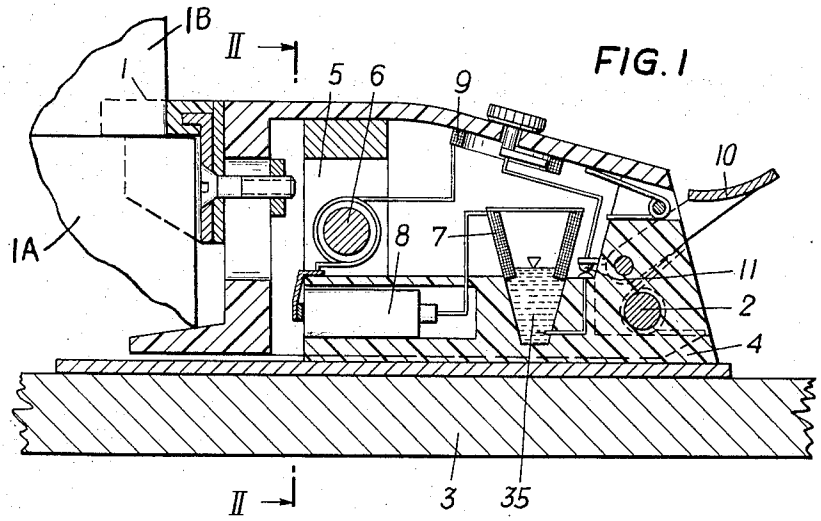


FIG. 2

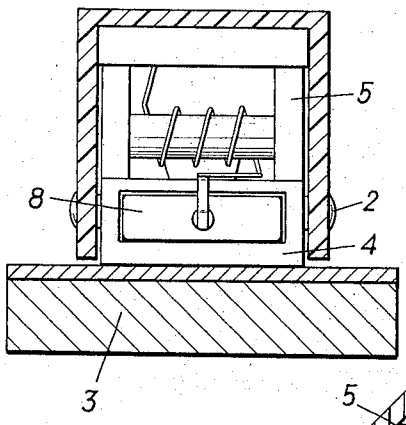


FIG. 3

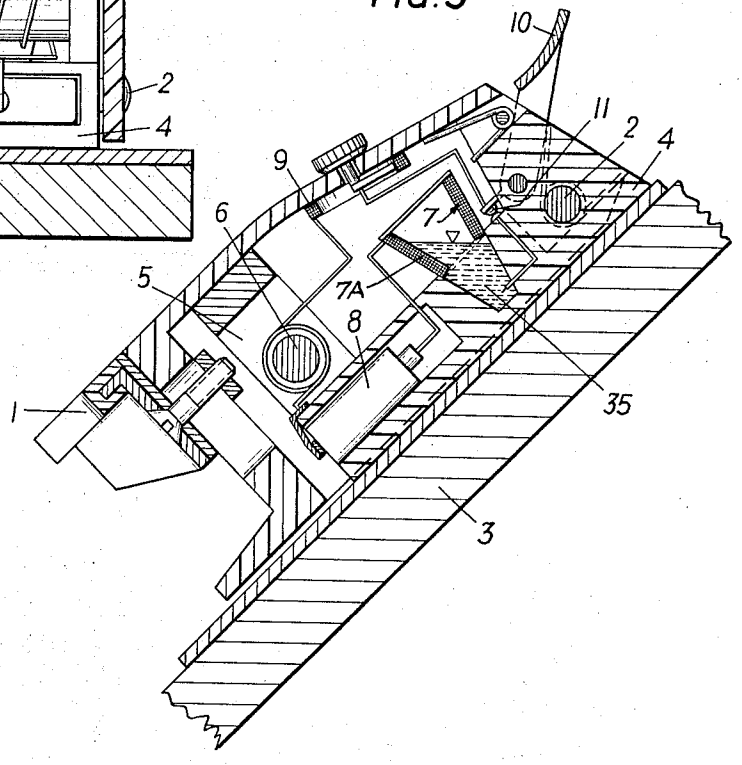


FIG.4

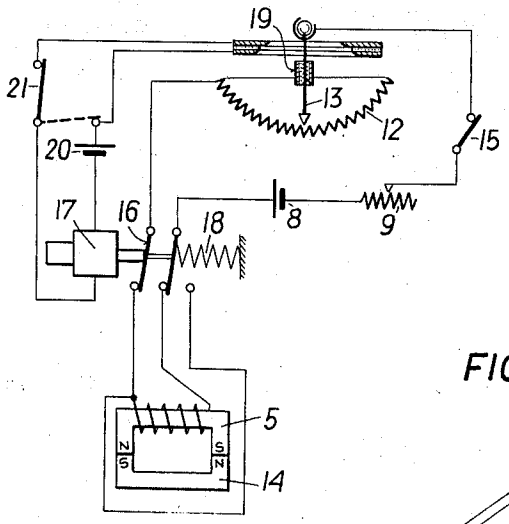


FIG.5

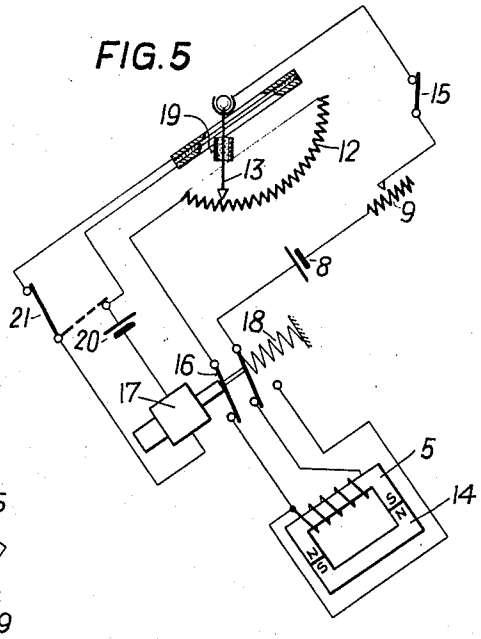


FIG.6

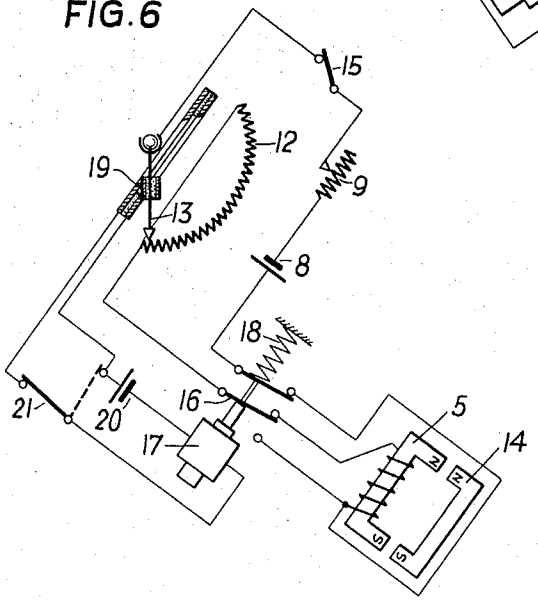


FIG. 7

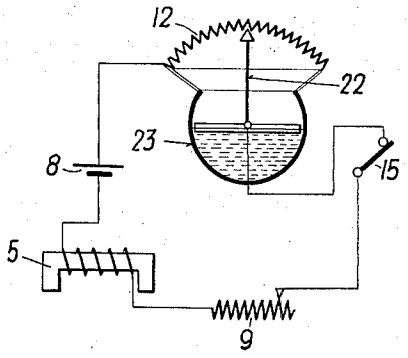


FIG. 8

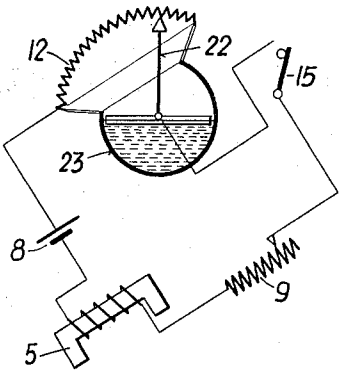


FIG. 9

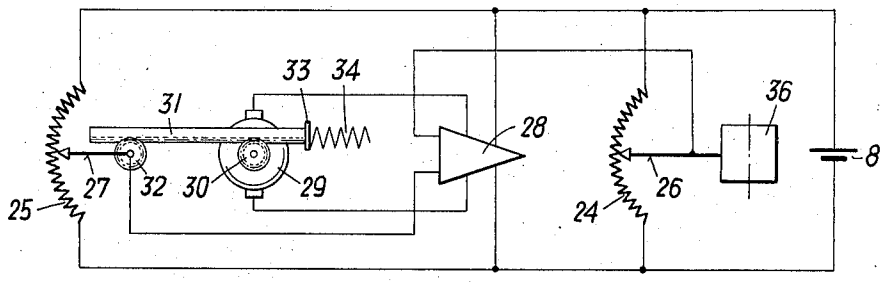
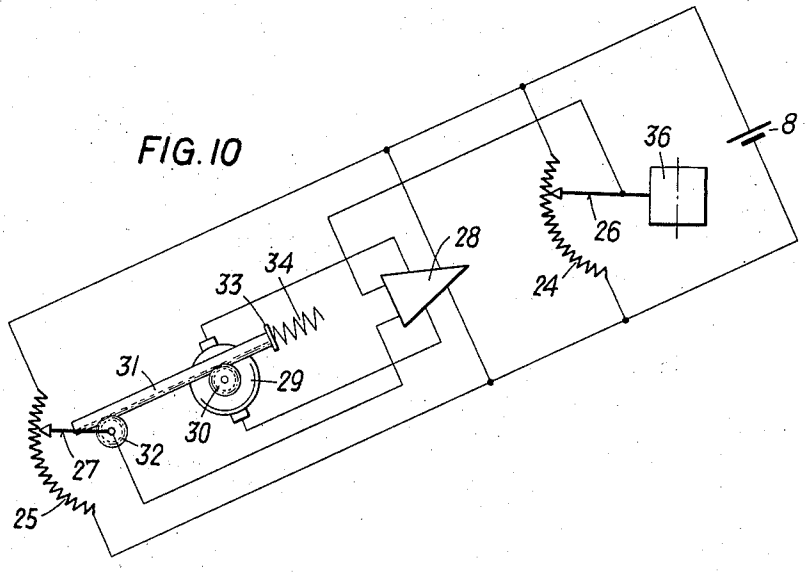


FIG. 10



SKI BINDING PART

The invention relates to a ski binding component, such as a heel binding, front jaw or the like, which is maintained in the position of use by a releasable locking mechanism having at least one setting mechanism.

Ski bindings are known which are adjusted as desired by the user. A safety release occurs only when the set release force is applied. However, it is generally true that during a more gentle downhill skiing a different setting is required than in the case of a steep downhill skiing. Specifically, the binding is intended to release in the one case in response to a relatively low release force and in the other case in response to a relatively high release force. It would therefore be necessary for the user always to change the setting immediately upon a change of the angle of slope during downhill skiing. This, however, is obviously wholly impractical.

Furthermore a ski binding is known (U.S. Pat. No. 3,367,672) which releases the ski boot in response to the inclination of the ski. Thus, a release takes place in this case only in the case of very steep hills. Thus, here too the user must very often adjust the binding corresponding to the different slopes of the terrain.

The purpose of the invention is to avoid these disadvantages and to provide a binding which continuously and automatically adjusts itself to existing conditions. This goal is achieved by providing a control or setting mechanism which continuously changes the holding power of the locking mechanism in response to the position or inclination of the ski. In this manner, the ski boot will be released from a less inclined ski at a different stress than from a sharply inclined ski without requiring the user to make any adjustments.

The subject matter of the invention is illustrated by the several exemplary embodiments appearing in the drawings, in which:

FIG. **1** is a central cross-sectional view of a heel binding embodying the invention.

FIG. **2** is a cross-sectional view along the line II—II of FIG. **1.**

FIG. **3** is a cross-sectional view of the same heel binding corresponding to FIG. **1,** wherein, however, the ski is inclined.

FIGS. **4** to **6** are circuit diagrams of different positions of an embodiment of the invention.

FIGS. **7** and **8** and **9** and **10** illustrate two positions of two further possible embodiments.

As will be seen in FIGS. **1** to **3,** the sole holder **1** is supported pivotably about the axis **2** of the base member **4** which is arranged on the ski **3.** An electromagnet **5** which is arranged on the base member **4** holds a plate **6** which is connected to the sole holder **1** for the sole **1A** of a ski boot **1B.** The coil of the electromagnet **5** is coupled through an adjustable, multi-winding, resistor, or rheostat **7** and a manually operated disconnect switch **11** to the battery **8.** The rheostat **7** is positioned in a container **35** which is arranged in the base member **4** and which is at least partly filled with a conducting liquid, particularly mercury. The multiple windings of the rheostat are uncovered so that in a tilted position of the ski the mercury body can make electrical contact with them.

At a horizontal position of the binding, as illustrated in FIG. **1,** the entire rheostat **7** is effective and the current effective on the magnet is low. However, if the ski slopes, the binding slopes, of course, also, as illustrated

for example in FIG. **3.** A number of windings **7A** of the rheostat **7** are now short circuited by the conducting liquid which is provided in the container **35.** Now only a portion of the rheostat **7** is effective and the current becomes greater in the coil of the electromagnet **5.** This increases the holding power of same.

To adjust the binding to the skiing capability, weight and the like of the user, a further adjustable resistor **9** which can be manually operated is provided in the circuit. To step out of the binding, the circuit is disconnected by pressing down the operating lever **10** which swings up and thereby opens the switch **11.**

In FIGS. **4** to **6** the control contact of the rheostat **12** is constructed to cooperate with a gravity responsive armature **13.** When the slope in all directions is to be considered, the armature **13** is suspended in a ball pivot and the resistance wire of the rheostat is wound in a spiral and calotte-shaped pattern. The electromagnet **5** is here mounted on a permanent magnet **14.** The coil of the electromagnet **5** is connected to the battery **8** through a reversing switch **16.** Further, a manually operable adjustable resistor **9** and a disconnect switch **15** are provided in the circuit.

If the binding slopes relative to the horizontal line (FIG. **5**), the armaturelike pendulum **13,** which always hangs vertically, will connect less windings of the rheostat **12** into the circuit. Thus the current intensity in the coil of the electromagnet **5** changes and the magnetic field thus also changes which again results in a change of the holding power of the magnet.

If the ski is extremely sloped (FIG. **6**), the current flow is reversed (as described below) by the reversing switch **16** and the poles of the electromagnet change so that like poles of the electromagnet **5** and the permanent magnet **14** are opposite one another. Thus, the two magnets **5** and **14** repel one another and the binding is opened.

To operate the reversing switch **16,** in this embodiment a further electromagnet **17** is provided which, when energized, moves the reversing switch against the force of the spring **18** into the position according to FIG. **6.** The energization of this second electromagnet **17** is accomplished by a contact **19** which is provided on the pendulumlike armature **13** and which closes the circuit of the electromagnet **17** and a second battery **20** at an extreme slope of the ski. This second circuit could, however, also be connected to the first battery **8.** A switch **21** is also provided in the second circuit. Said switch is used for stepping out of the binding. If it is moved into the position illustrated by dashed lines, it closes the circuit of the second electromagnet **17.** The reversing switch **16** reverses the polarity and the two magnets **5** and **14** repel each other.

In the exemplary embodiment of FIGS. **7** and **8,** the control contact **22** of the rheostat **12** is floatingly arranged in a container **23** on a liquid which in a conventional manner always has a horizontal surface. A disconnect switch **15,** a manually controllable rheostat **9** and an electromagnet **5** are connected into a circuit which is fed by the battery **8.** Regardless of the slope of the ski the surface of the liquid which is provided in the container **22** always remains horizontal (FIG. **8**). This changes the resistance which changes the current intensity and thus also the holding power of the magnet **5.**

In FIGS. **9** and **10** two rheostats **24** and **25** are connected in parallel to a battery **8.** The control contacts

26, 27 are coupled with a differential amplifier 28 for the overrun control, which latter controls an electric motor 29. If one of the two control contacts 26, 27 is adjusted, a voltage difference is created between the two rheostats, through which difference the amplifier 28 operates the electric motor 29, namely until the same voltage exists again on both rheostats 24 and 25.

The control contact 26 is connected to a gyroscope system 36 which is, for example, supported in gimbals and the axis of which is always in the same position. If the ski slopes (FIG. 10), the adjustable resistor 24 adjusts with respect to the control contact 26. Thus different voltage exists at the rheostats 24 and 25 and the amplifier 28 operates the electric motor 29. The gear 30 which is positioned on the shaft of the electric motor 29 engages a rack 31 which in turn engages a further gear 32. Said gear 32 is connected to the second control contact 27 and adjusts same with respect to the rheostat 25. The electric motor moves until equal voltage exists again on both rheostats 24 and 25. At the same time the gearing or the rack 31 acts onto an abutment 33 of a locking spring 34 through which the release force of the binding is changed.

The invention is not limited to the illustrated exemplary embodiments. Many further possibilities exist which lie within the scope of the invention. For example, in place of the illustrated control contact, a contact which is controlled by a balance beam could be provided. In the exemplary embodiment of FIGS. 1 to 3, a permanent magnet in place of the bar 6 could be connected to the sole holder. Also there exists the possibility of using two electromagnets. Of course, the invention can also be used in connection with front jaws and also with safety front tensioning means, as well as with ski bindings which are partly or entirely provided in the sole of a boot.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a releasable ski binding for holding a ski boot on a ski, said releasable ski binding having a base secured to said ski, a ski boot engaging member supported for movement between ski boot engaging and ski boot releasing positions and electrically responsive holding means for releasably holding said ski boot engaging member in said ski boot engaging position, the improvement comprising:

electrical control means connected in circuit with said electrically responsive holding means and producing a continuously varying electrical signal based on the changing inclination of the slope of said ski during skiing for continuously and automatically altering the holding force of said electrically responsive holding means in response to said inclination of the slope of said ski.

2. The improvement according to claim 1, wherein said holding means includes an electromagnetic coil; and

wherein said electrical control means further includes means defining a reversing switch for changing the current direction in said electromagnetic coil, said reversing switch being energized at an extreme sloped position of said ski.

3. The improvement according to claim 1, wherein said electrical control means includes means defining a container adapted to hold an electrically conductive liquid-like material and a plurality of windings defining a resistor mounted in said container and connected in circuit with said electrically responsive holding means, said electrically conductive liquid-like material contacting a plurality of said windings to produce said continuously varying electrical signal in direct relationship to the inclination of said slope of said ski.

4. The improvement according to claim 1, wherein said electrical control means includes means defining an electrical power supply and means defining a resistor connected in circuit with said electrical power supply and said electrically responsive holding means, said resistor means including contact means for continuously altering the resistance thereof in relationship to the slope of said ski to effect a continuously changing supply of electrical power to said holding means and a continuously changing holding force holding said ski boot engaging means in said ski boot engaging position.

5. The improvement according to claim 4, wherein said contact means is arranged floatingly in means defining a container of a liquid which always has a horizontal surface and, consequently, effects a changing of said holding force holding said ski boot engaging means in said ski boot engaging position.

6. The improvement according to claim 4, wherein said contact means is constructed as a pendulum.

7. The improvement according to claim 4, wherein said contact means is connected to a gyroscope.

8. The improvement according to claim 6, wherein said electrical control means includes means defining a second resistor means connected in parallel with the first mentioned resistor means, said second resistor means having second contact means associated therewith whereby said first mentioned and said second contact means are both coupled to an electrical differential amplifier for overrun control, said amplifier being connected to an electric motor which acts through gear means both onto said second contact means and also onto a spring for altering said holding force.

9. The improvement according to claim 4, wherein said electrically responsive holding means includes an electromagnetic coil, the energization of which effects a holding of said ski boot engaging means in said ski boot engaging position, said continuously changing supply of electrical power to said electromagnetic coil effecting said continuously changing holding force.

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