May 17, 1966 P. E. WREN 3,251,607

APPARATUS FOR THE ELECTROMAGNETIC CONTROL OF SKIS

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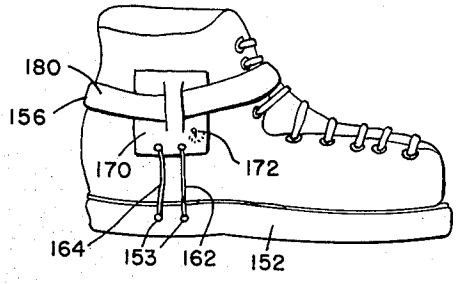


FIG. 1

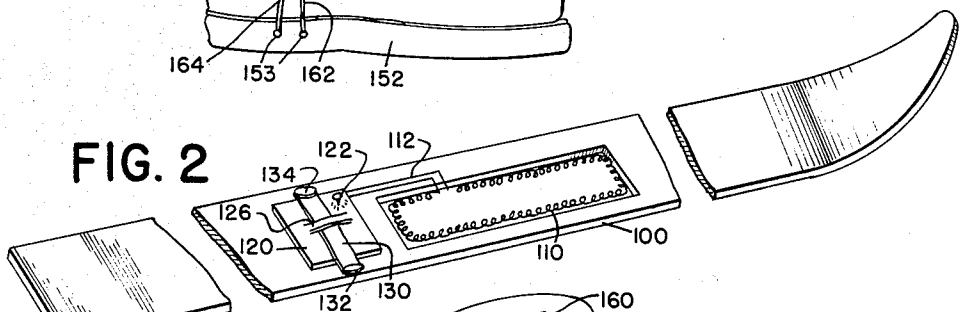


FIG. 2

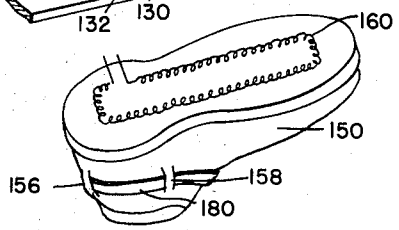


FIG. 3

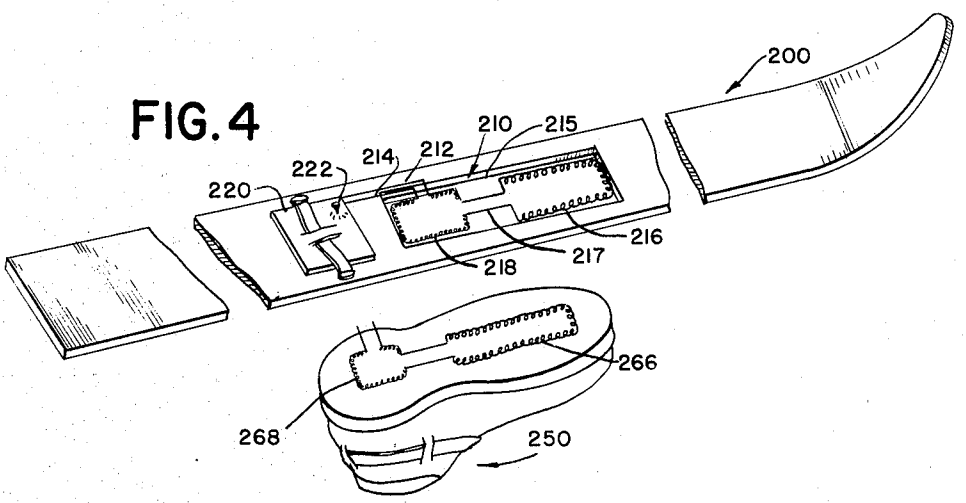


FIG. 4

FIG. 5

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FIG. 6

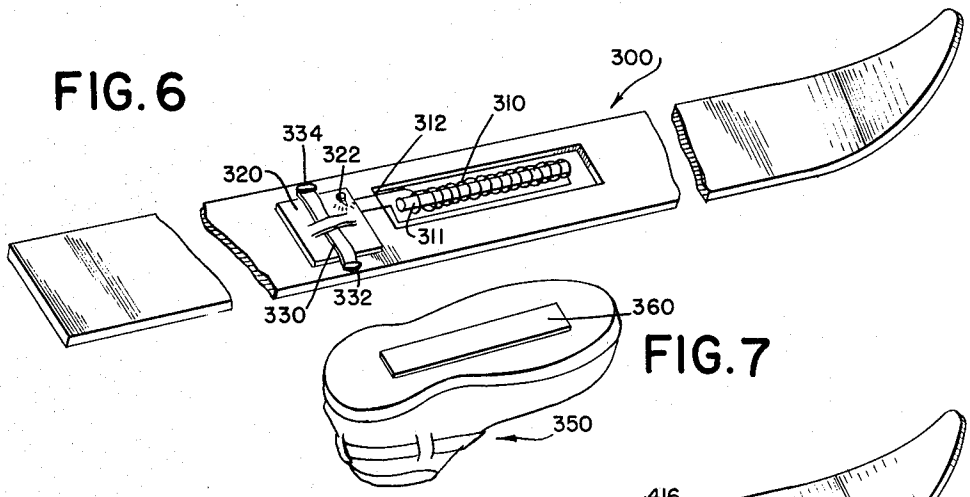


FIG. 7

FIG. 8

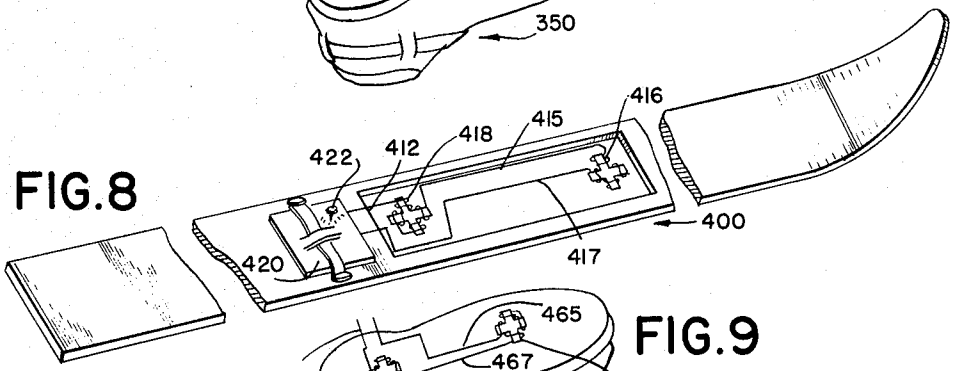


FIG. 9

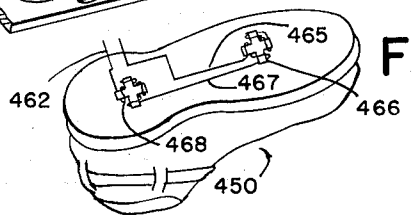


FIG. 10

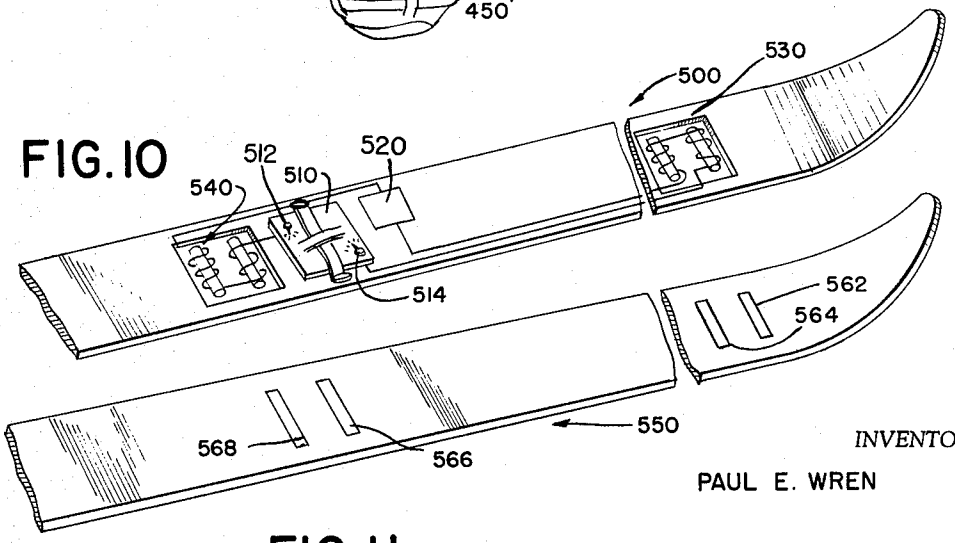


FIG. 11

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APPARATUS FOR THE ELECTROMAGNETIC CONTROL OF SKIS

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5 Claims. (Cl. 280—11.35)

The invention at hand concerns method and apparatus for the controlled binding of one articles to another. Specifically, this application describes novel method and apparatus for electromagnetically controlling skis and for attaching shoes to other objects, more particularly skis.

Historically, while skiing is a dangerous sport, most of the hazards arise as a result of falls which are accompanied by the non-release of bindings. Great leverage of a ski applies exceptional force through the fixed boot to the ankle of leg of its wearer. Often, the extreme force is sufficient to break bones, sprain ligaments or strain muscles.

Great improvements in the are of the ski bindings have reduced the number of ski casualities from that which might be expected in the absence of safety bindings. The problem has no been fully solved, however, because most bindings do not allow equal break away freedom in every direction. Moreover, different forms of skiing require special binding consideration. Cross country, downhill, slalom, expert and novice skiing severally impose individual binding requirements. Not finding the precise control desired in existing safety bindings, some experts fully abandon caution and, trusting in their own prowess for safety, lash their boots to skis with thong bindings.

This invention provides a novel magnetic binding that has full freedom of motion with equal break away protection in all directions. Both heel and toe are held by the same binding, providing heretofore unknown equal protection for all vulnerable areas of the lower leg, ankle and foot. Moreover, the strength of the binding is completely and easily adjusted by switches at the power packs. Using this invention the same set of bindings will be equally valuable to the novice or expert; the same bindings will be useful in sport or competition skiing.

One object of this invention is the provision of magnetic ski bindings; another object it to provide electromagnetic bindings. Further objectives are the introduction of skis and boots or a combination thereof having electromagnets and self-contained power sources to adjust the magnets.

Further objectives of this invention will be apparent from an inspection of the accompanying drawings, in which:

FIGURE 1 is an elevation of a boot, demonstrating a suggested location of the power source;

FIGURE 2 is a perspective view of a ski, showing an electromagnetic binding and its attached power source;

FIGURE 3 is a bottom view of a ski boot, which may be the boot shown in FIGURE 1;

FIGURE 4 is a perspective view of a ski, showing a modification of an electromagnetic binding;

FIGURE 5 is a bottom view of a boot to be used with the ski shown in FIGURE 4;

FIGURE 6 is a ski having a magnet with a permeable core;

FIGURE 7 is the bottom view of a boot, having a permeable core, for cooperation with the binding of FIGURE 6;

FIGURE 8 illustrates a multiple pole binding;

FIGURE 9 suggests a cooperating multiple pole boot bottom;

FIGURES 10 and 11 illustrate polarized magnetic apparatus for the parallel control of skis.

Referring to the drawing, a basic inductive ski-boot binding is shown in FIGURES 1, 2 and 3. Coil **110** is recessed medially in ski **100**. Leads **112** from each end of the coil pass through the ski and emerge adjacent nickel-cadmium battery pack **120**, which supplys a voltage on coil **110**. The amount of applied voltage is adjusted by potentiometer control **122**. Battery pack **120** is mounted on ski **100** immediately to the rear of the boot engaging area and is there secured by strap **130**, which extends through loop **126** atop the battery pack, and which is secured at its ends by ski-mounted catches **132** and **134**.

As best shown in FIGURES 1 and 3, looped coil **160**, which is equidimensional to coil **110**, is recessed in the bottom or sole **152** of boot **150**. Insulated wires **162** and **164** extend laterally through openings **153** in the sole, emerge on its exterior side, or the side away from the instep, and plug into battery pack **170**, which is mounted by strap **180** on the exterior side of boot **150**. In a manner similar to the operation of the ski field power control **122**, the strength of the magnetic field created by coil **160** is controlled by adjustng potentiometer **172**. Battery pack **170** is removably mounted on conventional ski boot **150** by strap **180**, which extends through boot loops **156** and **158** (FIGURE 3).

The strength of each magnetic field and accordingly, the strength of their mutual influence can be controlled by moving potentiometer dials **122** or **172** on the ski or boot. Accordingly, the binding will offer the desired degree of attraction and consequent break away upon adjustment.

Preferably the ski and boot are held against planar movement by a raised sixteenth inch bead forming the outline of the boot sole on the ski. Alternatively the sole and its corresponding ski surface may be roughened.

FIGURES 4 and 5 illustrate a variation of the apparatus shown in FIGURES 1 and 3. Coils, generally indicated by the numeral **210** and serially connected as illustrated at **217**, are recessed medially at **215** in the ski **200**. The toe portion **216** has fewer windings or turns than the heel portion **218**, upon which greater separating forces are concentrated and which physiologically withstand greater stress.

Voltage is supplied to coils **210** from the rear mounted battery pack **220** by the leads **212** and **214**, the bias of which is controlled by potentiometer **222**. Individual voltage drops across coils **216** and **218** are, of course, proportional to the number of turns therein.

Boot **250** is substantially the same as conventional boot **150**, having a nickel-cadmium power supply strapped on its upper portion. Recessed in the sole of the boot are series connected coils **266** and **268**, which cooperate with corresponding heel and toe coils on the ski.

While it is not necessary that the number of turns in each corresponding boot and ski coil be the same, efficient operation suggests that the ratio of turns in heel and toe coils be the same in the boot as it is on the ski.

FIGURES 6 and 7 illustrate a third embodiment of this invention in which recessed coil **310** encompasses permable core **311** midway on ski **300**. Leads **312** connect coil **310** and power supply **320**, the output of which is controlled by potentiometer **322**. Battery pack **320** is lashed to ski **300** by strap **330** which terminates in ski fixtures **332** and **334**. Boot **350** is a conventional ski boot having a recessed permeable plate **360** located contrally in the boot sole.

Refering to FIGURES 8 and 9, ski **400** is equipped with recssed radiant pole electromagnets **416** and **418**, having given numbers of poles. In the present case each magnet has four external poles. The magnets

are serially connected by wires **412**, **415** and **417** to power pack **420**, which includes potentiometer **422** for the control of its output. Boot **450** includes electromagnets **466** and **468**, serially connected as illustrated at **465** and **467** which respectively correspond with ski mounted electromagnets **416** and **418**. Insulated leads **462** emerge from the edge of the sole and extend into a potentiometer-controlled, boot-mounted power supply, such as that shown in FIGURE 1. Adjusting the potentiometer controls the mutual attraction of ski and boot to the degree desired for the type of skiing to be undertaken

FIGURES 10 and 11 illustrate a variation of my electromagnetic control for skis, in which battery pack **510** operates through vibrator type control circuit **520** to intermittently supply voltage of successively alternated polarity to ganged forward coils **530** and after coils **540**. Potentiometers **512** and **514** control the bias on each of the magnets. Companion ski **550** has permanent magnets **562**, **564**, **566** and **568** mounted thereon at intervals corresponding to the electromagnets **530** and **540**, mounted on ski **500**.

Intermittent pulsing in reversed polarity controls the parallel relation of the skis while maintaining their separation. An alternate apparatus may be constructed using more or less electromagnets or replacing the permanent magnets of ski **550** with pulsed electromagnets.

The invention has been described by way of example rather than limitation. Thus, it will be apparent that one skilled in the art may employ other embodiments of the disclosure without departing from the scope of this invention. Thus, electromagnetic footholds in objects other than skis are herein included.

I claim:

1. A boot and ski combination comprising: self-contained, electric power producing means carried by said combination; manually adjustable control means connected to said power producing means for producing a controlled output voltage; wire coil means carried by said ski and electrically connected to said control means whereby said coil means produces electromagnetic influence of controlled magnitude; external means acted on by said electromagnetic influence, said external means being associated with said boot and holding the same in engagement with said ski with a holding force proportional to the magnitude of the electromagnetic influence.

2. Apparatus as in claim **1** wherein said external means includes wire coil means carried by said boot and disposed in opposed relationship to the coil means carried by said ski when said boot an ski are in engagement, said apparatus including means electrically connecting power means with the wire coil means carried by said boot.

3. Apparatus as in claim **1** wherein the coil means carried by the ski includes at least two coils spaced apart along the length of the ski so as to be disposed opposite the heel and sole of the boot when the boot member and ski are in engagement, said coils being serially connected and containing different numbers of turns whereby the holding force at the sole and heel of the boot are different.

4. Apparatus as in claim **3** wherein said external means associated with said boot includes a first coil associated with the heel of the boot and a second coil associated with the sole of the boot, said first and second coils being serially connected and containing different numbers of coils, said apparatus further including means electrically connecting said electric power producing means with the wire coil means carried by said boot.

5. Apparatus for releaseably securing a boot to a ski comprising: a source of electric power carried by said ski; manually adjustable control means carried by said ski and connected to said power source for producing a controlled output voltage; wire coil means carried by said skit and electrically connected to said control means whereby said coil means produces electro-magnetic influence, said coil means including at least two coils spaced apart along the length of said ski so as to be disposed opposite the heel and sole of said boot when said boot and ski are in engagement, the forwardmost coil having a fewer number of turns than the other coil and being serially connected therewith; a source of electric power carried by said boot; manually adjustable control means connected to said power source for producing a controlled output voltage; wire coil means carried by said boot and electrically connected to the control means carried by said boot whereby said coil means produces electromagnetic influence, said coil means including a first coil associated with the heel of said boot and a second coil associated with the sole of said boot, the sole coil having a fewer number of turns and being serially connceted with the heel coil.

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