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Pradillon

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[54] **SKI BINDING**

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[73] Assignee: **Mitchell S.A.,** Thyez, France

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[30] **Foreign Application Priority Data**

May 11, 1973 France 73.17222

[52] **U.S. Cl.**.... **280/11.35 T,** 116/135, 116/DIG. 11

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

[58] **Field of Search**..... 280/11.35 T; 116/135, 116/DIG. 11, 133, 134

[56] **References Cited**

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3,337,225	8/1967	Smolka	280/11.35 T
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Primary Examiner—Robert R. Song
Attorney, Agent, or Firm—Robert E. Burns; Emmanuel J. Lobato; Bruce L. Adams

[57] **ABSTRACT**

A ski safety binding comprises spring means for releasably holding the binding in a closed position, a screw for adjusting the force of the spring, and means for displaying the adjustment including two members movable relative to one another as a function of the setting of the screw, the first member covering the second member and being provided with a plurality of discrete openings, and the second member having a plurality of discrete color marks which are selectively visible through said openings in different relative positions of said members to provide indications representing the settings. Said openings include at least one row of a plurality of like openings aligned along the direction of relative movement of the members and said marks include at least one row of a plurality of marks aligned along said direction with said row of openings. Adjacent openings in said row are spaced apart by at least the length of an opening along said direction multiplied by the number or positions of said members each corresponding to an indication.

9 Claims, 8 Drawing Figures

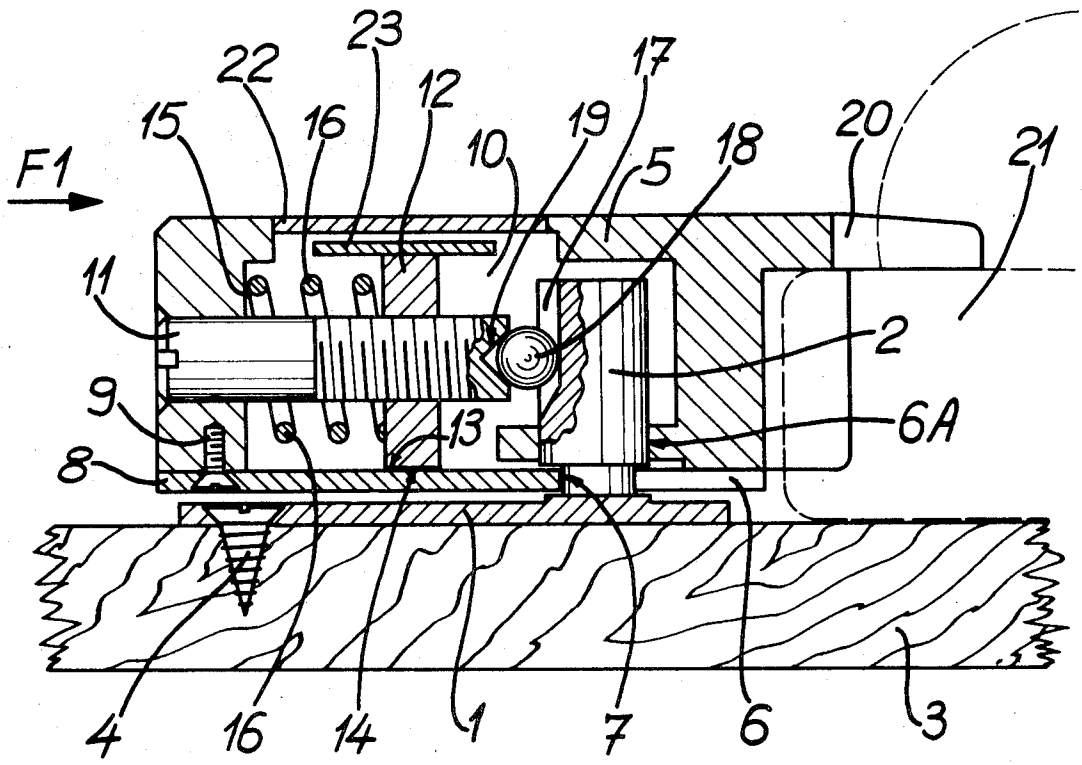


FIG. 1

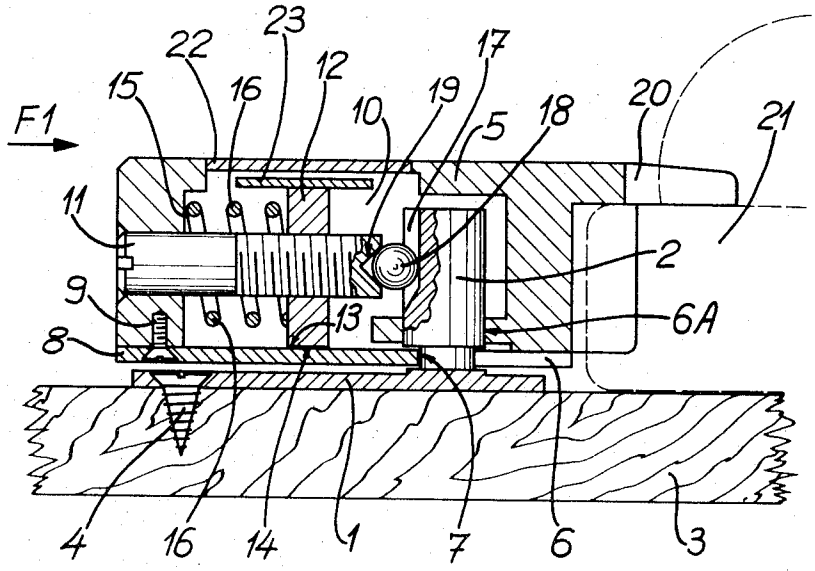
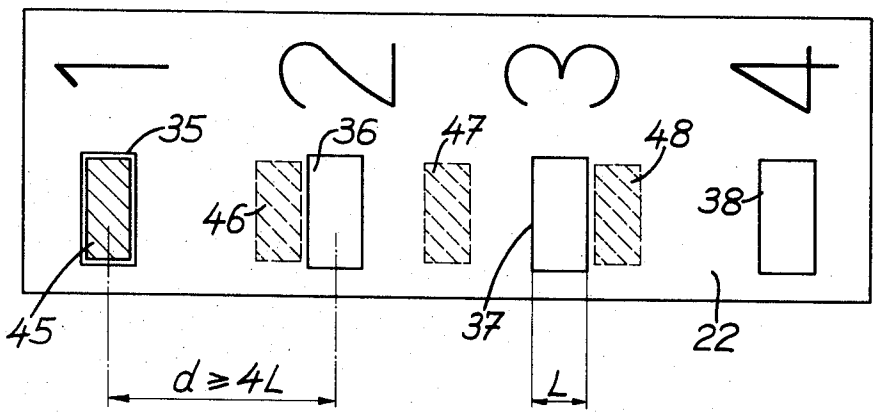


FIG. 2



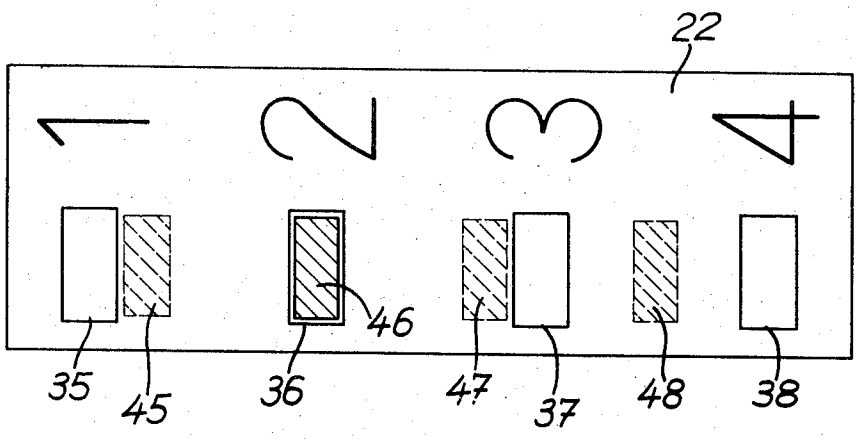


FIG. 3

FIG.4

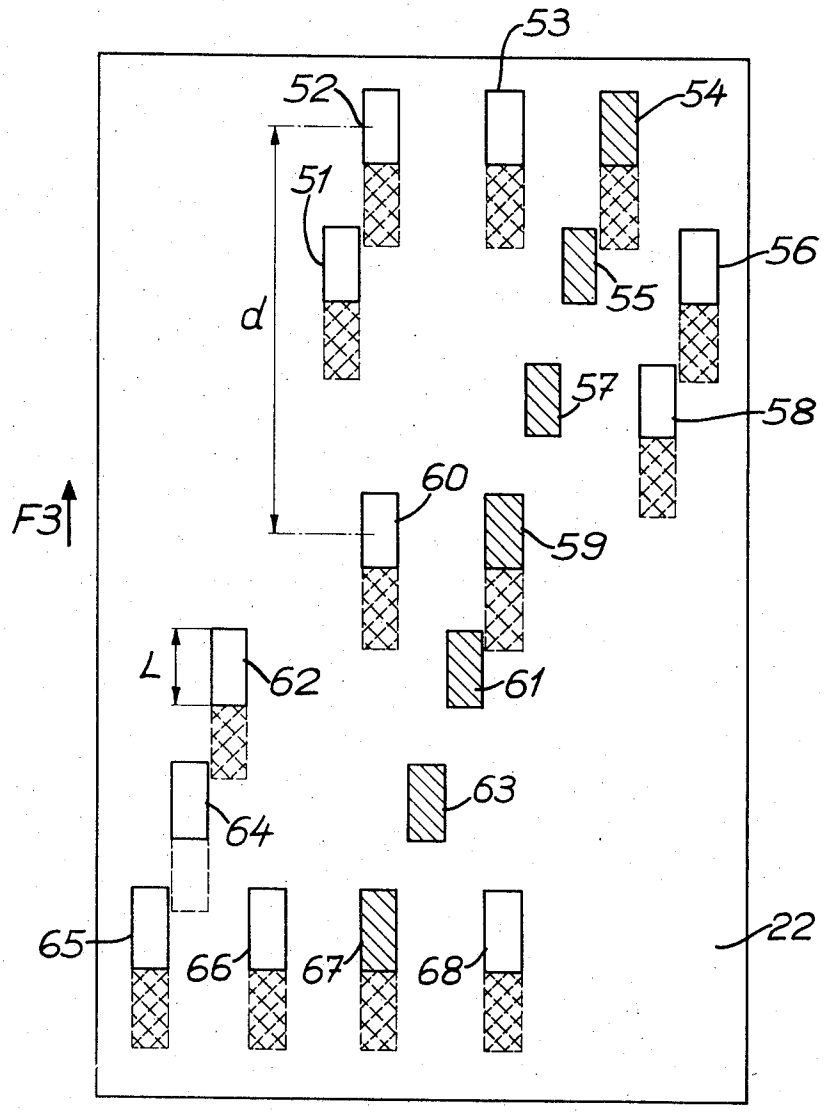


FIG. 5

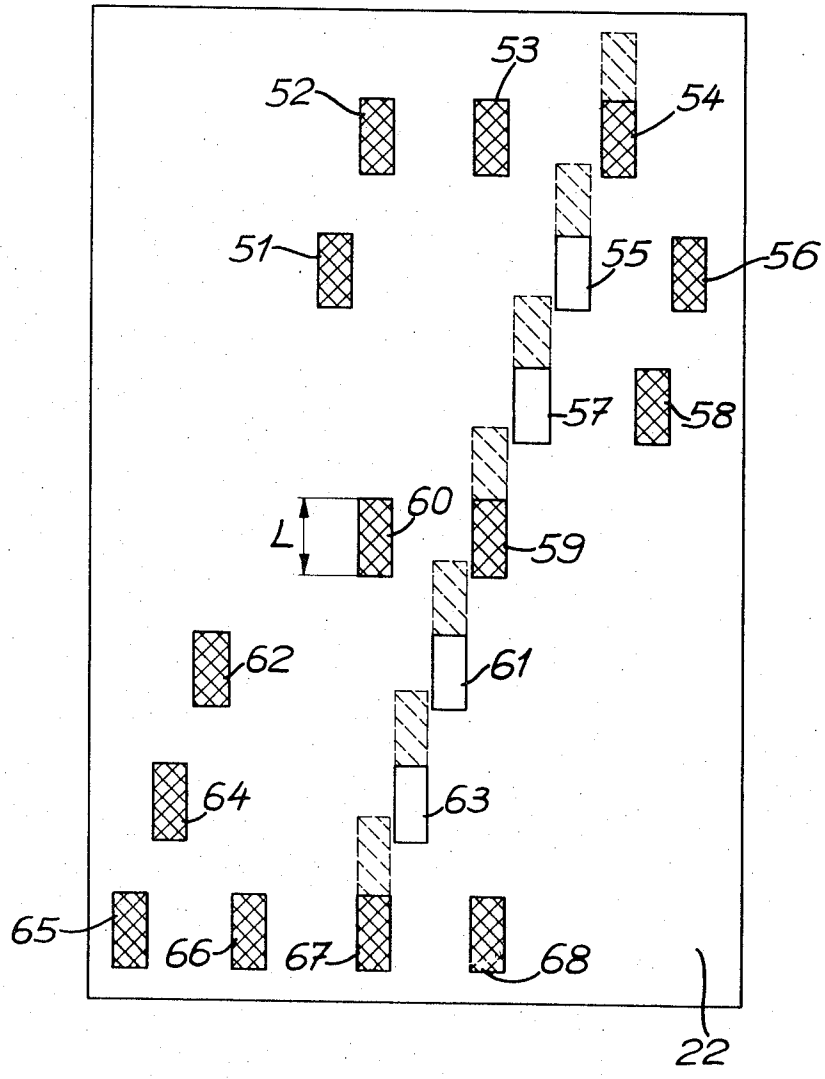


FIG. 6

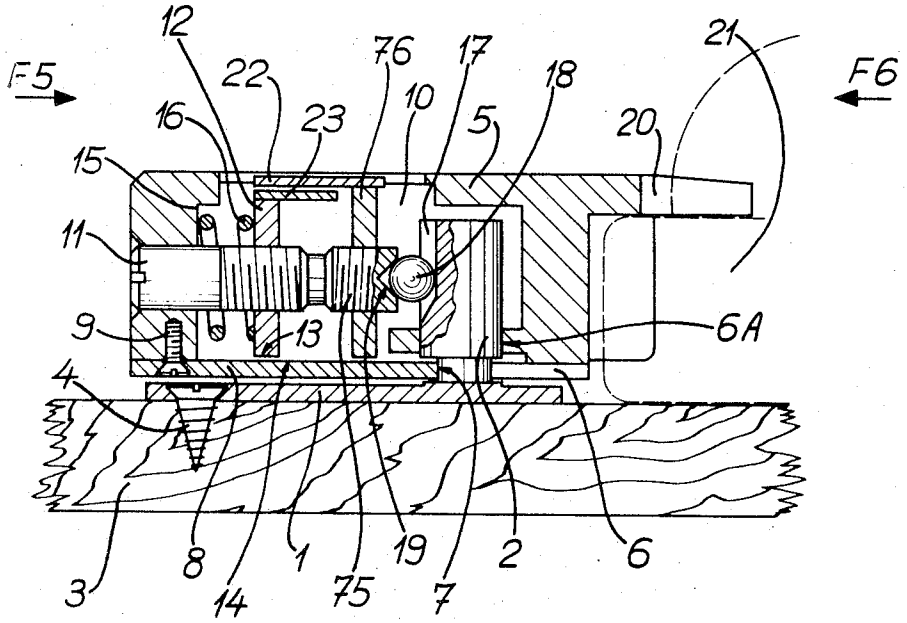
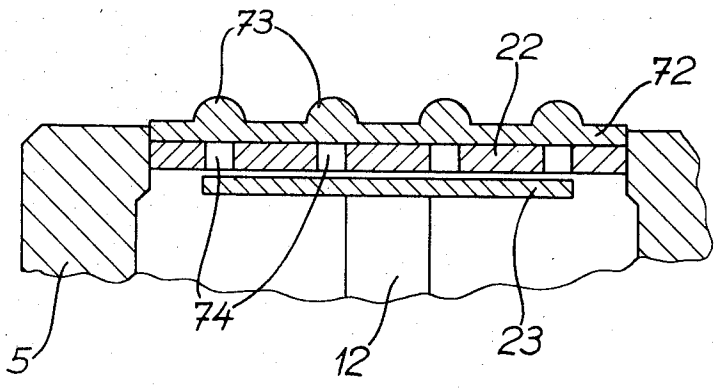


FIG. 7



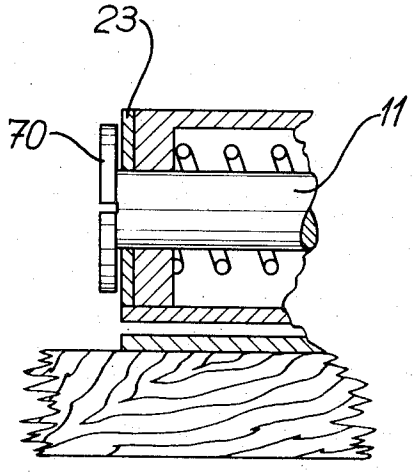


FIG. 8

SKI BINDING

The invention relates to ski safety bindings and is particularly concerned with the display of the setting of a spring, or in general any elastic or other energy storage means, which acts with an adjustable force to releasably hold the binding in a closed or boot-gripping position.

U.S. Pat. No. 3,172,677 describes a display device formed by a fixed graduated plate past which an end of an adjusting lever moves, the other end of the lever being formed as a cam acting on the compression of a spring. Another display device described in U.S. Pat. No. 3,172,677 is formed by a regulating button having peripheral graduations cooperating with a fixed mark, this button actuating a coaxial cam for setting the compression of a spring. Although in both of these devices there is an amplification of the displacement of the part providing the display compared to the displacement of the part compressing the spring, reading of the indications, which must be placed side-by-side on the same part or element, is hindered by their reduced dimensions.

Another known display device consists of a fixed window through which can be seen a rotatable wheel controlling the spring compression by means of a gear-reducing mechanism. Such devices are complicated and costly and also have the disadvantage that the indications which appear successively through the window must all be placed on the same wheel and are therefore of limited dimensions.

French Patent No. 1,447,799 describes a display device formed by a pin fixed on a nut screwed on an adjustment screw for the spring of a binding. This pin engages in an oblong slot and serves both to prevent rotation of the nut and to provide an indication of its axial position. This device is simple, but is even more difficult to read than the preceding devices since there is no amplification of the movement of the pin.

U.S. Pat. No. 3,489,122 discloses a device for setting and indicating the relative positions of ski binding members in which perforations are provided in a cover of the binding and a single colored area, visible as color markings through the perforations, is provided on a plate disposed under and movable relative to the cover. As the binding setting is tightened, the colored area becomes visible through one, then two, then three perforations. Since the relative movement of the two members between each setting is small, the successive openings are staggered transverse to the direction of relative movement, and the colored area is provided with a stepped shape. The spacing of the windows along the direction of movement is thus small, which limits legibility of the indications.

An object of the invention is to provide a device for displaying the settings of a ski binding which has two members movable relative to one another by small amounts to provide, without a need for a mechanical gear system, indications the spacing or the size of which is considerably greater than the amount of the displacement whereby reading of the indications is facilitated.

According to the invention, a ski safety binding comprises energy storage means for releasably holding the binding in a closed position, means for adjusting said energy storage means to adjust the force holding the binding in the closed position, and means for displaying the adjustment of said energy storage means. Said display means include first and second members movable relative to one another along a given direction and means for moving said members between a plurality of discrete relative positions as a function of the setting of said adjustment means. The first member covers the second member and is provided with a plurality of discrete openings, and the second member has a plurality of discrete marks which are selectively visible through said openings in different relative positions of said members to provide indications representing the settings of said adjustment means. Said openings include at least one row of a plurality of like openings aligned along said given direction and said marks include at least one row of a plurality of marks aligned along said given direction with said row of openings, adjacent openings in said row being spaced apart by at least the length of an opening along said given direction multiplied by the number of discrete relative positions of said members each corresponding to an indication.

Said marks may have any appropriate dimensions, shape and color and may in particular be of a luminescent paint of a color contrasting to the color of said second member.

The accompanying drawings show, by way of example, several embodiments of the invention. In the drawings:

FIG. 1 is an axial cross-section of a binding secured on a ski;

FIGS. 2 and 3 are schematic plan views of a first form of display device in two different settings;

FIGS. 4 and 5 are schematic plan views of another form of display device in two different settings;

FIG. 6 is an axial cross-section of another binding secured on a ski;

FIG. 7 is a cross-section showing a detail of a varied form of display device; and

FIG. 8 is a cross-section of part of another binding secured on a ski.

The binding shown in FIG. 1 comprises a base plate 1 supporting a shaft 2 perpendicular to plate 1 which is secured to a ski 3 by screws 4. A casing 5 is pivotally mounted on shaft 2 by means of a bearing 6A. Casing 5 is held on base plate 1 by a plate 8 with an axial slot 6 of sufficient width to closely fit in a groove 7 of shaft 2, this plate 8 being held on casing 5 by screws 9. The casing 5 has an inner housing 10 for the shaft 2 and an adjusting screw 11 which is slidably mounted along the axis of casing 5. A nut 12 on screw 11 is held against rotation by cooperation of its face 13 with face 14 of plate 8, but can move axially along screw 11 during rotation thereof. Between the screw 12 and face 15 of casing 5 is disposed a helicoidal compression spring 16 biasing nut 12 and hence its supporting screw 11 in the direction of arrow F1. Shaft 2 has a recess 17 receiving a ball 18 which is held in this recess, under the action of spring 16, by a recess 19 in the end of screw 11. Casing 5 includes a jaw 20 adapted to hold the sole 21 of a boot against vertical and lateral displacement.

In operation, under the action of spring 16 against nut 12, the screw 11 is held pressed against the ball 18 lodged in groove 17 of shaft 2. The entire casing 5 is thus held against rotation about shaft 2 so that the boot sole 21 held by jaw 20 is prevented from moving laterally. The binding only moves out of this "closed" or boot-retaining position when the boot exerts a sufficient lateral force to overcome the resistance of spring 16 involved in moving ball 18 out of recess 17 by axi-

ally pressing back the screw **11**, which enables pivoting of casing **5** about shaft **2**. The screw **11** thus enables adjustment of the compression of spring **16** and setting of the force required to release the binding. In the upper part of casing **5** is a device for displaying the degree of compression of spring **16**, formed by a member **22** fixed to and forming part of the cover of casing **5** and a movable member **23** fixed on nut **12**. Member **23** is placed under member **22** from the point of view of a person looking down onto the binding. The fixed member **22** includes a plurality of suitably arranged discrete openings, and movable member **23** a plurality of discrete marks whose dimensions correspond to those of the openings and are arranged to be selectively visible through the openings in different discrete relative positions of the members.

FIGS. **2** and **3** show one form of display device including a number $n = 4$ openings **35, 36, 37, 38** disposed in a single row parallel to the direction of movement of member **23** (i.e., to screw **11**, FIG. **1**). Beside each opening is placed a corresponding reference indication, namely the numbers **1, 2, 3** and **4**, the number n of openings being chosen according to the desired number of reference indications. Member **23** carries four marks **45, 46, 47, 48**, i.e., the same number n as the number of openings. These marks, shown in hatched lines, are disposed in a single row parallel to and aligned with the row of openings. The distance d between successive openings is equal to at least the length L of an opening, measured along the direction of movement of member **23**, multiplied by the number n of openings and marks each corresponding to an indication, and the distance between successive marks is equal to $(n-1)$. d/n. In the particular example shown, d is at least 4L, and the distance between successive marks is $\frac{3}{4}d$.

In the position shown in FIG. **3**, when the mark **45** is visible through opening **35**, corresponding to the indication **1**, all of the other marks are staggered in relation to the respective openings and are thus concealed. By turning the screw **11** to shift nut **12** and member **23** by an amount L, and vary the compression of spring **16** by a corresponding amount, the device adopts the position shown in FIG. **3** in which only mark **46** is visible through opening **36** corresponding to the indication **2**, and all of the other marks are concealed. Similarly, as the member **23** is shifted by further amounts L, the marks **47** and **48** will successively and singly be visible through the respective openings **37** and **38**.

Since the distance between successive openings is in this example equal to 4L, and the indications can have a height approaching 4L, it can be seen that for a shift of screw **11** and member **23** by an amount L, it is possible to obtain an apparent shift of the visible mark through a distance 4L, and the visible mark is associated with a large and clearly legible indication.

FIGS. **4** and **5** show a second form of display device which may be embodied in the binding of FIG. **1**. The fixed member **22** includes several rows of openings, each row being disposed along an axis parallel to the direction of movement of member **23**. Movable member **23** includes as many rows of marks as there are rows of openings in member **22**, each row of marks being aligned with a row of orifices and the number of marks of each row being at least equal to the number of openings of the corresponding row. Several marks from one or several rows form a reference indication of given configuration and all of the points forming a single indication appear simultaneously through the corresponding orifices. The distance d between two successive orifices of the same row is at least equal to the dimension of the orifice measured along the direction of movement of member **23** multiplied by the number of indications previewed. The distance between two successive marks of the same row is at most equal to d and at least equal to the dimension L of the orifice.

Hence, in the example shown, member **22** has fourteen rows of openings, some of which include only a single opening. Member **23** also has fourteen rows of marks each aligned with a row of orifices. The openings of member **22** are designated by reference numerals **51** to **68**.

On FIG. **7**, marks appear simultaneously in openings **54, 55, 57, 59, 61, 63** and **67**, as indicated by hatched lines, this configuration forming the indication "**1**." The other openings are not used for this setting, i.e. the visible non-marked surface of member **23** is of the same appearance as the member **22**, so that it is difficult to discern these openings. In the example shown, five indications are previewed (although, for the sake of clarity, the openings and marks for only two indications are shown), and the distance d between successive openings of the same row is equal to five times the dimension L of the openings measured along the direction of movement of member **23**; this is so for the openings **52, 60** and **67**; and **53, 59** and **68**, and the distance between the corresponding successive marks is also $d = 5L$.

Taking the position of FIG. **7** as the initial position, the indication 1 is visible and all of the marks which are not required for the configuration 1 are masked from view by the member **22**. When the screw **11** is acted upon, it compresses spring **16** and moves nut **12** and member **23**. The originally visible marks forming the figure 1 move with member **23** along direction F3 relative to member **22** until the two members arrive at the position shown in FIG. **8**. The marks which had previously been visible as the figure 1 are masked from view by member **22** and the marks now visible through openings **51, 52, 53, 54, 56, 58, 59, 60, 62, 64, 65, 66, 67** and **68** form an indication in the configuration of the number 2. These marks are shown by cross-hatched lines in FIG. **8**. It is observed that for a displacement of screw **12** and member **23** by an amount L, the visible indication changes from **1** to **2** and these indications have a height several times greater than L, generally speaking at least nL, which renders them easily visible. In fact the height of the indications may be quite independent of the value of the shift L. It should be noted that in the example of FIGS. **7** and **8**, only the openings and marks enabling the numbers **1** and **2** to appear are shown, whereas the distance d between successive openings of a row is equal to 5L, which will enable five indications to appear successively.

According to a variation of this embodiment, successive marks of one row and/or juxtaposed marks of several rows are joined together to form a single mark of greater area. The two marks appearing successively in opening **54** and those appearing successively in opening **59** are examples of joined marks whose "separation" along the direction of movement is equal to L.

According to another variation of the previous embodiments, an optical magnifying device is disposed on at least one of the fixed and mobile members facing

each opening and/or each mark. FIG. 7 shows a display device in which an optical magnifying device is provided above fixed member **22**. This magnifying device is for example formed by a single plate **72** of transparent plastic material including substantially semi-spherical protuberances **73** each forming a converging lens over an opening **74**. Each visible mark is thus magnified, thus facilitating reading.

In yet another variation, the cover member with the opening is mobile and kinematically connected to the adjustment means, and the inner member carrying the marks is fixed to the main frame or casing of the binding.

In a further variation of the preceding embodiments, the member **22** with the openings and member **23** with the marks are both movable along the same path either in the same direction or, as shown in FIG. **6**, in opposite directions. In this arrangement, the screw **11** includes not only the previously described threaded part on which the nut **12** supporting member **23** is disposed, but also a second threaded part **75**, disposed concentric to the first but at the end of the screw towards ball **18**, this second part having a thread of opposite hand to the first part and with an equal pitch, as shown, or a different pitch. Threaded part **75** supports a nut **76** which, like nut **12**, can move axially along screw **11** and is held against rotation by the surface **14** of casing **1**. Member **22** including the openings is fixed on this nut **76**.

In operation, when the screw **11** is rotated to adjust spring **16**, nut **12** and member **23** move for example in direction F5 and nut **76** and element **22** move in the opposite direction F6. There is thus a greater relative displacement of members **22** and **23** than the displacement of nut **12** compressing spring **16**, in a proportion that can be modified by choice of the pitch of nut **76**. All of the other elements are the same as in the previously described embodiments.

According to another variation of the described embodiments, shown in FIG. **8**, the mobile member instead of moving with a rectilinear movement relative to the fixed member is rotatable. Hence, in the example shown, element **23** carrying the marks is fixed on an outer face of the binding casing, and the openings are provided in a flange **70** integral with setting screw **11**.

According to a variation of the second embodiment, each opening and/or each of the marks able to appear in said opening is divided into two parts; possibly, only certain openings and certain marks are thus divided into two or more parts. This enables if required a better configuration of the indications to be provided.

The invention is applicable to both front or toe bindings and to rear or heel bindings and may be used whenever it is required to provide an indication of the release effort which has to be read clearly.

What is claimed is:

1. A ski safety binding comprising energy storage means for releasably holding the binding in a closed position, means for adjusting said energy storage means to adjust the force holding the binding in the closed position, and means for displaying the adjustment of said energy storage means, said display means including first and second members movable relative to one another along a given direction, means for moving said members between a plurality of discrete relative positions as a function of the setting of said adjustment means, the first member covering the second member and being provided with a plurality of discrete openings, and the second member having a plurality of discrete marks which are selectively visible through said openings in different relative positions of said members to provide indications representing the settings of said adjustment means, said openings including at least one row of a plurality of like openings aligned along said given direction and said marks including at least one row of a plurality of marks aligned along said given direction with said row of openings, adjacent openings in said row being spaced apart by at least the length of an opening along said given direction multiplied by the number of discrete relative positions of said members each corresponding to an indication.

2. A ski binding according to claim **1**, comprising a single row of n openings and a single row of n marks, successive openings being spaced apart by a distance d and successive marks by a distance $(n-1)\cdot d/n$.

3. A ski binding according to claim **1**, including several rows of openings and corresponding rows of points, each of said indications being formed of points in one or more rows able to appear simultaneously through corresponding orifices, the distance between two successive points of a row in which the openings are spaced apart by a distance d being at most d and at least equal to the length of the orifices along said given direction.

4. A ski binding according to claim **3**, in which at least one of an opening and a point able to appear in said opening is divided into at least two parts.

5. A ski binding according to claim **3**, in which adjacent points in at least one row are joined together.

6. A ski binding according to claim **1**, comprising optical means for magnifying points visible through said openings.

7. A ski safety binding comprising energy storage means for releasably holding the binding in a closed position, means for adjusting said energy storage means to adjust the force holding the binding in the closed position, and means for displaying the adjustment of said energy storage means, said display means including first and second members movable relative to one another along a given direction, means for moving said members between a plurality of discrete relative positions as a function of the setting of said adjustment means, the first member covering the second member and being provided with a plurality of discrete openings, and the second member having a plurality of discrete marks which are selectively visible through said openings in different relative positions of said members to provide indications representing the settings of said adjustment means, said openings including a plurality of like openings spaced apart from one another along said given direction and said marks including a corresponding plurality of like marks each aligned along said given direction with at least a corresponding one of said openings, adjacent openings being spaced apart along said given direction by a multiple of the length of an opening along said given direction, and the spacing of adjacent points along said given direction being less than the spacing of the corresponding adjacent openings along said given direction by an amount corresponding to the relative displacement of said members between adjacent discrete relative positions whereby upon relative displacement of said members successive respective ones of said points appear singly in corresponding successive respective ones of said openings.

8. A ski binding according to claim 7, comprising a single row of n openings and a single row of n marks aligned along said given direction with said openings, successive openings being spaced apart by a distance d equal to at least the length of an opening along said given direction multiplied by n, and successive marks being spaced apart by a distance $(n-1)\cdot d/n$.

9. A ski safety binding comprising energy storage means for releasably holding the binding in a closed position, means for adjusting said energy storage means to adjust the force holding the binding in the closed position, and means for displaying the adjustment of said energy storage means, said display means including first and second members movable relative to one another along a given direction, means for moving said members between a plurality of discrete relative positions as a function of the setting of said adjustment means, the first member covering the second member and being provided with an array of a plurality of discrete openings, and the second member having a plurality of discrete marks which are selectively visible through openings of said array in different relative positions of said members to provide indications representing the settings of said adjustment means, said marks including a plurality of groups of marks corresponding to groups of openings of said array, each of said groups of marks and corresponding openings having a distinctive shape forming an indication whose size along said direction is at least the length of an opening along said direction multiplied by the number of discrete relative positions of said members each corresponding to an indication.

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