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Salomon

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[54] **METHOD AND APPARATUS FOR DETERMINING THE LOCATION OF A SKI BINDING ON A SKI IN ACCORDANCE WITH THE SIZE OF A SKIER'S BOOT**

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[52] **U.S. Cl.** ..... **33/192,** 280/11.35 E

[51] **Int. Cl.** **B43l 9/08,** A63c 9/00

[58] **Field of Search** ..... 33/192, 191, 189; 280/11.35 E, 11.35 A, 11.35 D, 11.37 T

[56] **References Cited**

UNITED STATES PATENTS

1,703,736	2/1929	Jacob	33/192
2,186,479	1/1940	Elliott	280/11.35 E
2,576,639	11/1951	Purvis	280/11.35 A
2,599,819	6/1952	Fisher	33/191
3,101,201	8/1963	Hall	280/11.35 A
3,618,220	11/1969	Skelton	33/189

FOREIGN PATENTS OR APPLICATIONS

733,258	5/1966	Canada	280/11.37 T
29,737	5/1919	Norway	280/11.35 A

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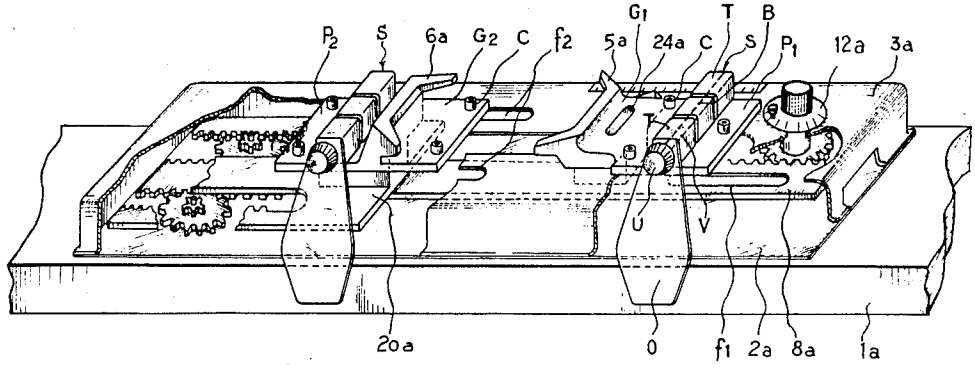
Assistant Examiner—John W. Shepperd

[57] **ABSTRACT**

The method consists in making the ski binding jaws moveable along the longitudinal axis of the ski, mechanically connecting the jaws so that the movement of one jaw in one direction causes the movement of the other jaw in the opposite direction, and acting on the mechanical connection between the jaws so that the jaws are moved simultaneously by single control means until the jaws reach a relative position where the sole of an appropriately-sized boot is enclosed and held to the ski.

14 Claims, 4 Drawing Figures



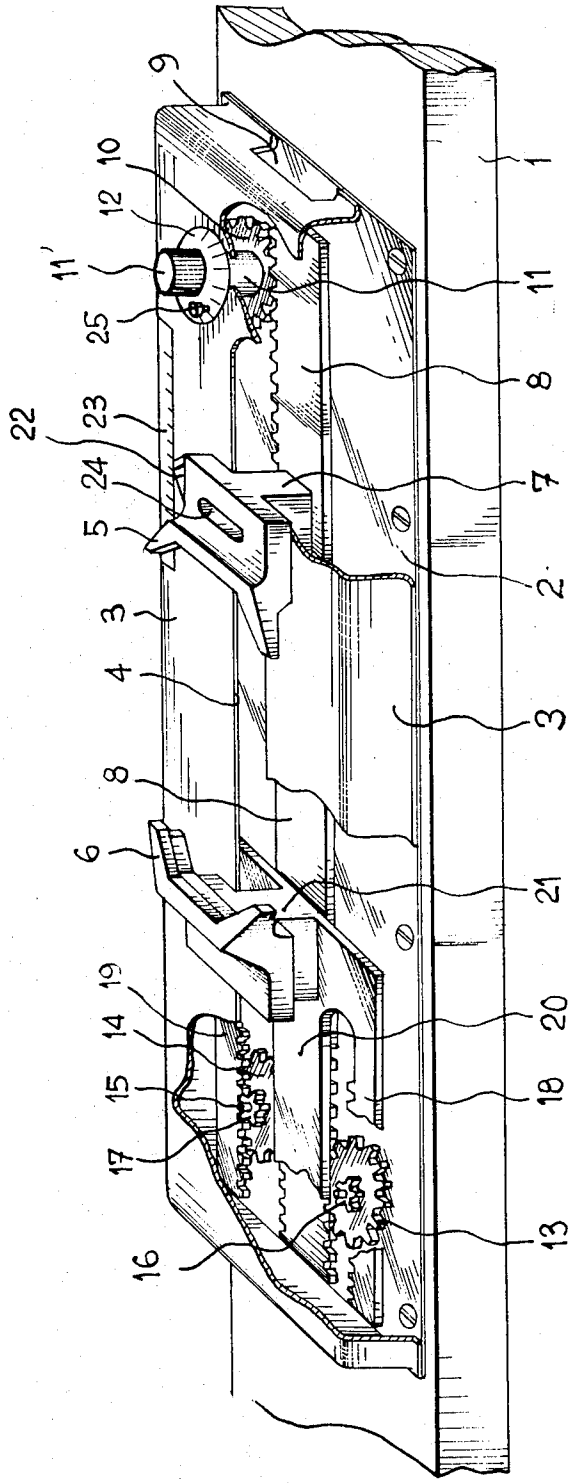


Fig. 1

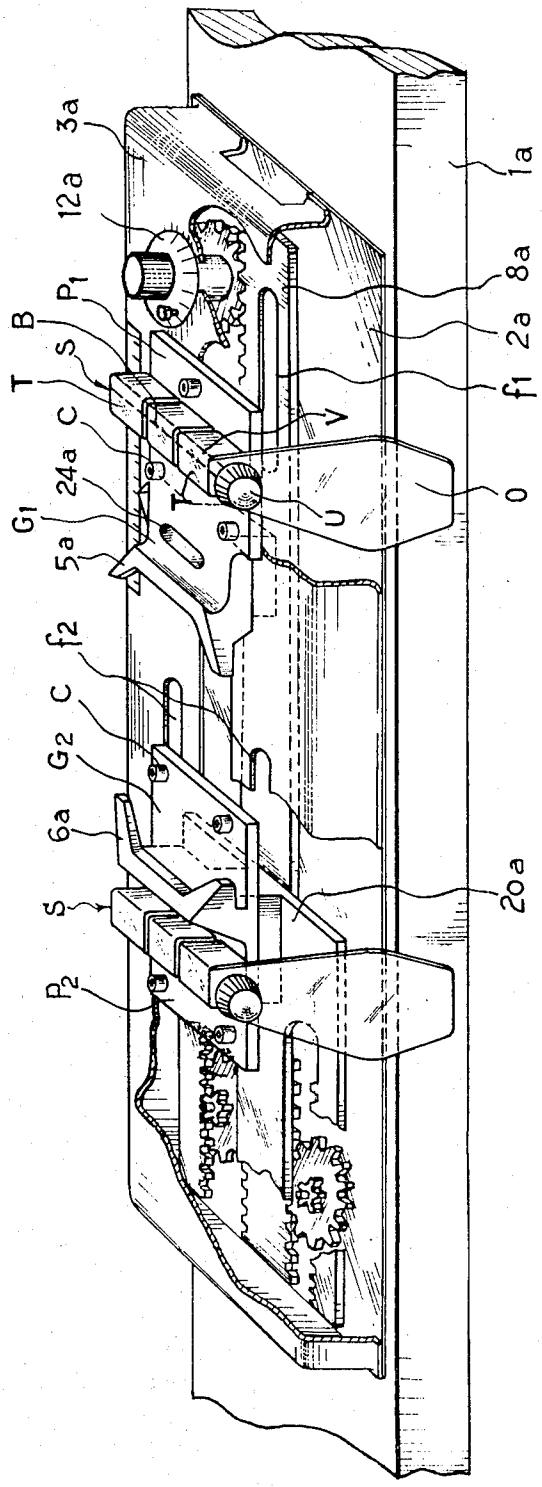


Fig.1a

FIG. 2

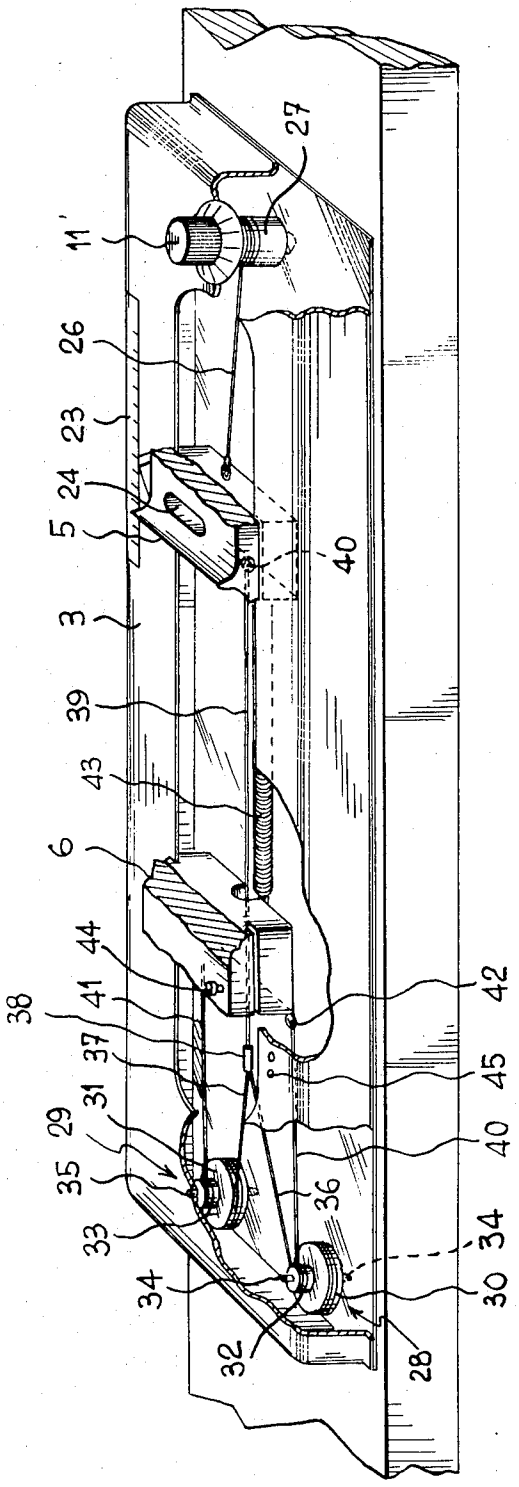

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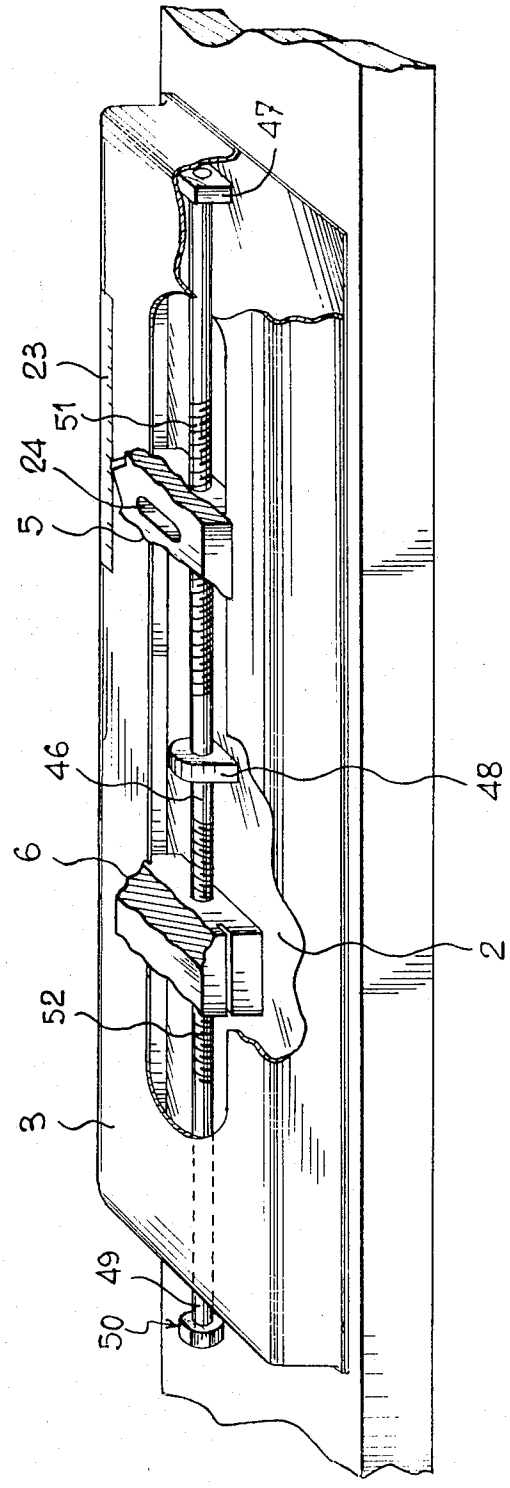
FIG. 3



METHOD AND APPARATUS FOR DETERMINING THE LOCATION OF A SKI BINDING ON A SKI IN ACCORDANCE WITH THE SIZE OF A SKIER'S BOOT

This invention relates to a method and apparatus for adapting a system of binding a boot to a ski as a function of the size of boot worn by the skier.

It is known that when safety bindings are mounted on a ski, it is customary to arrange for the front of the boot to be located substantially at the centre of the ski. More rarely, and depending on the type of run (downhill, slalom) the skier desires to undertake, the mounting may be such that the front of the boot is located slightly in front of, or on the contrary, slightly behind the centre of the ski.

In this connection, the centre of the ski serving as the reference point is actually defined for an average size boot (for example, size 40,5 for a 2 m ski). Now the majority of conventional ski bindings having a toe stop and a heel piece are designed in a manner such that the distance between them is adapted to different sizes of boot by moving only the heel piece. In other words, once the toe stop is attached to the ski, there is no way of altering the position thereof.

At the present time, only a few manufacturers provide means for altering the positions of the mounted bindings. Moreover, any such alteration involves adjustments independent of the heel piece and toe stop, which doubles the adjusting time.

Furthermore, there is no convenient way of ascertaining, at the time when the ski-bindings are being mounted, the optimal position for the holes used to assemble the bindings to the ski, this adjustment being carried out in a somewhat empirical manner.

It should also be pointed out that this possible double adjustment of the ski bindings is almost impossible to carry out at a ski resort, since it is a delicate and lengthy operation which would cut seriously into the skiing time available.

Thus quite unbelievable situations arise, especially in the case of rented skis, since a ski of a given length may be rented to one customer wearing a size 38 boot and to another customer wearing a 45, with no change being made in the position of the toe stop.

Under these circumstances, the skis rented to the first customer would be suitable for a special slalom event, while the second customer could use them only for downhill skiing.

It will therefore be appreciated that if the customer uses the skis for a type of skiing for which they are not suitable, he may get into serious trouble and even fall.

It is an object of this invention to overcome this problem by means of a simple and economic solution which can be used by the skier himself.

More particularly, the present invention is concerned with ascertaining from a reference position corresponding to a standard boot size, the correct location of the safety bindings on a ski, in order to adapt the bindings to the size of boot worn by the skier. Moreover, this is achieved without altering the characteristics of the pair of skis.

To this end, the process according to the present invention consists in: making the front and rear jaws mobile in the longitudinal axis of the ski; mechanically connecting the jaws in a manner such that moving one jaw in one direction causes the other jaw to move in the other direction; and in acting upon the mechanical connection between the jaws to displace them simultaneously in a single operation, until the jaws are located in a position such that the sole of the boot may be clamped and held to the ski.

The jaws may, of course, move at the same speed under the action of the mechanical connection, but in one preferred form of embodiment these movements take place at different speeds in relation to the ski. It is preferable that the heel piece move at a lower speed than the toe stop.

It will be noted that this ability, provided by the invention, to carry out adjustments at different speeds makes it possible to depart from the arrangement now in general use, whereby the front of the foot is in a substantially fixed position at the centre of the ski. This provides a considerable advantage from the point of view of efficiency and safety. Indeed, it has been found that, if the characteristics of the ski are to be maintained, the axis of the leg should be located at all times at the same point on the ski, regardless of the size of the boot worn by the skier.

The device according to this invention makes it possible to maintain the axis of the skier's leg at all times in the same location in relation to the ski, if the ratio between the respective speeds of movement of the jaws is made equal to the ratio between the distances between the axis of the leg and the front and rear ends of the sole.

Since the distance between the axis of the leg and the tip of the boot is approximately three times the distance between the axis of the leg and the heel of the boot, it is of advantage for the speeds in question to be in a ratio of 3 to each other.

In other words, if the front jaw moves at three times the speed of the rear jaw, the axis of the leg will at all times be at the same location in relation to the ski, regardless of the size of the boot worn by the skier.

The present device for carrying the above process is one in which the jaw components slide in a fixed structure comprising a means for longitudinal guidance, the jaws being connected to each other by a mechanism which derives them in opposite directions along the longitudinal axis of the ski, the mechanism having a single control.

Where the jaws move at different speeds, speed-reduction means co-operating with at least one of the jaws provided.

One advantage of the system according to the invention is that it may be used practically without modification:

- for ascertaining the location of the permanent assembly holes in the ski;
- for adapting a particular binding to various boot sizes (for example when skis are rented).

Several preferred forms of embodiments of this present invention will now be described in conjunction with the drawings attached hereto, wherein:

FIG. 1 is a schematic illustration in perspective of a device according to the invention having a rack-and-pinion drive particularly suitable for adjusting the safety bindings mounted on the ski;

FIG. 1*a* illustrates a device identical with that shown in FIG. 1 but adapted more particularly to drilling the holes for assembling the binding to the ski;

FIG. 2 is a view similar to those in FIG. 1 and 1*a*, in which the drive consists of a system of cables; and

FIG. 3 is a view similar to those in FIGS. **1**, **1***a* and **2** in which the drive system for the retaining elements is a screw.

As already stated above, the system according to the invention is equally suitable for:

ascertaining the location of the holes for permanently assembling the safety binding to a ski, in relation to a position of reference, for a given size of boot; and

adjusting the distance between the two elements of a binding mounted on a ski, this adjustment making it possible to adapt the binding to several boot sizes.

Since, as will be seen hereinafter, the essentials of the device may be used for either purpose without modifying the structure thereof, FIGS. **1** and **1***a* show an example of each of the possible adaptations, whereas, for the sake of simplicity, FIGS. **2** and **3** show only that part of the device which remains identical regardless of the use to which it is put.

In FIG. **1**, the numeral **1** indicates the central portion of a ski, to which is attached, by means of screws for example, a base plate **2** enclosed in a housing **3** attached to plate **2** by any suitable means (screwing, crimping, welding, etc.). Housing **3** has a longitudinal slot **4** located along the axis of the ski, in which are located a front stop **5** and a heel piece **6**. These will not be described in detail since they are conventional safety bindings. It is merely pointed out that the front stop has a downward extension **7** which passes into the housing and is integral with a primary rack **8** running practically along the entire length of the housing and adapted to protrude therefrom through windows **9** arranged in the ends thereof.

Ahead of stop **5**, rack **8** engages with a control pinion **10** integral with a vertical shaft **11** rotatably mounted both in base plate **2** and in the upper housing **3**. Shaft **11** serves to set the device to the size of boot, and may with advantage be equipped with a knob **11'** carrying reference marks **12** making it possible to adjust the binding as a function of the size of boot worn by the skier.

Behind the heel piece, the rear end of rack **8** engages with two lateral pinions **13, 14** mounted to rotate freely about vertical axes **15** located in base plate **2** and housing **3**.

Pinions **13, 14** are integral with pinions **16, 17** of reduced diameter engaging with the toothed branches **18, 19** of a secondary rack **20** integral with base **21** of heel piece **6** which extends across slot **4** in the housing.

It will be observed that front stop **5** may carry a pointer **22** moving along a scale **23** indicating the length of the ski.

It is preferable to provide an opening **24** in front stop **5** through which a mark corresponding to the centre of the ski may be seen when the housing is being assembled to the ski. Of course, base plate **2** also has an opening which exposes the mark.

In order that the mark indicating the centre of the ski may be visible through opening **24**, the distance between the toe stop and the heel piece must be equal to the standard boot size, i.e. 40.5 for a ski 2.5 m in length; in this case, pointer **22** on the stop points to the mark on the scale corresponding to the length of the ski used.

In order to lock the toe stop and the heel piece in relation to each other as soon as the device has been set to the boot size, means may be provided to lock knob **11'** to the housing. Any known arrangement may be used for this purpose, for example a spring finger **25** engaging in one of a series of holes in the surface of the housing.

The operation of the device described above is very simple, and may be gathered from the description thereof. It will be observed that in the particular case illustrated, the heel piece moves at one third of the speed of the front stop, since the step-down ratio between the pairs of pinions **13 – 16** and **14 – 17** is 1:3.

FIG. **1***a* illustrates the case in which the device according to the invention is used to determine the location of the holes used to assemble the safety-binding system permanently to the ski, and also to drill the said holes.

The essentials of this device are identical with that in FIG. **1**, except that:

1. baseplate **2A** (in the form of a frame exposing the central part of the ski), which is integral with housing **3***a*, is placed on ski **1**a in a manner such that it may be moved longitudinally in order to find the centre of the ski through opening **24***a*;
2. stop **5** and heel piece **6** in FIG. **1** are replaced by drilling templets G_1 and G_2 respectively having jaws **5***a* and **6***a* between which the boot is accommodated. Like jaw **5** is FIG. **1**, templet G_1 is integral with primary rack **8***a*, while templet G_2 is integral with secondary rack **20***a*. Jaws **5***a* and **6***a* are also integral with horizontal plates P_1, P_2 equipped with drill jigs C (four in plate P_2, three in plate P_1, in the example illustrated) to guide the drills which drill into the ski the holes into which are inserted the screws permanently assembling the conventional toe stop and heel piece to the ski.

It will be noted that in order to make it possible to drill these holes in the ski, any mechanical parts between the drill jigs and the ski will have appropriate openings below the jigs, as shown at f_1 in rack **8***a* and at f_2 in housing **3***a*.

In order to hold the device in place once it is set, and to allow accurate drilling of the holes, each drilling templet is equipped with a clamping mechanism, indicated in a general manner by S, which will be described only briefly since it is a known device which is not a part of the invention. Each of the clamping mechanisms has two lateral ears O extending vertically on each side of the ski; ach ear O is integral with a head T, the flat bottom surface of which slides on plate P_1 (or P_2). Heads T have internal threads of the same pitch but opposite hand and are aligned by means of a fixed central dowel B integral with plate P_1 (or P_2). A screw V passes through heads T and dowel B, the screw being prevented by the dowel from moving axially, but being free to rotate under the action of a knob U. The parts of the screw engaging with heads T have left and right-hand threads, so that rotation of knob U causes heads T to move simultaneously towards or away from dowel B. It will be understood that when heads T move towards each other, ears O clamp the device to the ski and lock the drilling templets in position.

It will also be understood that the arrangement in FIG. **1a** has numerous advantages making the operation of drilling the skis simpler, faster, safer, and more accurate.

Once the drilling device is pre-set to a reference boot-size (for example 40.5), the following procedure

is all that is required to drill the skis for another size, for example 44;

release ears O and move the unit shown in FIG. 1*a* along the ski so that the ski centre mark appears in opening 24*a*;

separate the drill templets by operating the rack system by means of knob 12*a*, without moving housing 3*a*;

place the size 44 boot between jaws 5*a* and 6*a* and bring the jaws together by means of the rack system until the boot is securely held;

clamp ears O to the ski and proceed with the drilling operation.

FIG. 2 illustrates an arrangement similar to that in FIGS. 1 and 1*a*, except that the rack and pinion is replaced by a system of cables. By way of simplification, FIG. 2 (like FIG. 3) shows only those parts of the jaw structure such as are required in order to understand the invention, it being understood that the system may be applied, as has been seen in connection with FIGS. 1 and 2, both in conjunction with drilling templets and when safety bindings are directly available. Hooked to the front face of front jaw 5 is a cable 26 which winds around shaft 27 of the size-setting knob, to which one end of cable 26 is attached.

Located behind rear jaw 6 are two pairs of pulleys 28, 29, each consisting of a large-diameter pulley 30, 31 and a smaller diameter pulley 32, 33, the pulleys being integral with common vertical axes 34, 35.

Attached to large pulleys 30, 31 are the ends of cables 36, 37 which pass around the pulleys and unite at 38 with the end of an axial cable 39, the opposite end of which is attached at 40 to the rear face of jaw 5.

Attached to small pulleys 32, 33 are the ends of two secondary cables 40, 41, the opposite ends of which are hooked at 42 to the rear face of rear jaw 6.

A spring 43 is preferably hooked between the front and rear jaws and urged these two elements towards each other. It is, of course, quite conceivable that the rear jaw could be pushed or pulled towards the front jaw by means of a spring, or any other resilient system, arranged differently from spring 43 but performing the same function.

In this variant, especially when a safety system is used, it will be of advantage, after the size-setting operation, to lock the front and rear jaws in relation to the ski, in order to prevent any unwanted movement thereof while skiing. Use may be made of a locking system similar to that in FIG. 1, namely, a spring finger 44 engaging in one of a series of holes 45 in the housing.

A description will now be given of the device illustrated in FIG. 3. In this case, the mechanical size-setting system consists of a rod 46 running inside the housing along the longitudinal axis of the ski, the rod being mounted in the housing in a manner such that it is free to rotate therein but cannot move axially. To this end, the forward end of the rod is mounted in a stationary bearing 47 integral with the housing and in an intermediate bearing 48 integral with baseplate 2.

Bearings 47 and 48 are of a conventional type which allows the rod to rotate without moving axially. Rear end 49 of the rod protrudes from housing 3 and carries an adjusting knob 50. The rod also has two threaded zones 51, 52 running respectively between bearings 47 and 48 and between bearings 48 and knob 50. Threads 51, 52 are of opposite hand, for instance thread 51 may be right-handed and thread 52 left-handed. Thread 51 co-operates with a threaded hole in the structure of front jaw 5, while thread 52 engages with a threaded hole in the structure of rear jaw 6. Finally, in order that the front jaw may move at three times the speed of the heel piece, the pitch of thread 51 is three times that of thread 52.

It is to be understood that the rotation of rod 46 by means of knob 50 causes the front and rear jaws to move simultaneously towards or away from each other (depending on the direction of rotation of the said rod).

What I claim is:

1. A templet device for drilling a ski in order to locate along the longitudinal axis of the ski the positions for securing to the ski, front and rear parts of a safety ski binding relative to a reference position carried by the ski and corresponding to a standard ski boot, whatever the size of the ski boot, said device comprising:

a housing carrying clamping means for detachably securing said housing on said ski, said housing having a longitudinally elongated slot;

a front plate and a rear plate engaged in said slot of said housing and slidable therein, said front and rear plates having drill jigs;

a reverse drive mechanism located in said housing and connecting said front and rear plates for moving said plates along the longitudinal axis of the ski in opposite directions; and

a single control means acting on said drive mechanism for moving said plates.

2. A device according to claim 1, wherein said drive mechanism comprises: a primary rack secured to one of said plates; a secondary rack secured to the other plate; at least one pair of integral pinions meshing respectively with one of the primary and secondary racks; and a control pinion adapted to be operated by the user and meshing with one of the two racks for displacing said one rack.

3. A device according to claim 2, wherein the step-down ratio between the two pinions of a pair is 1/3, the larger diameter pinion meshing with the primary rack.

4. A device according to claim 2, wherein said front and rear plates are provided with jaws.

5. A device according to claim 2, wherein said control pinion is secured to said single control means.

6. A device according to claim 1, wherein said drive mechanism comprises: a frist cable constituted in two parts, one end of one of said parts being connected to one of said plates and the other end thereof wound to a rotating control shaft adapted to be operated by the user and one end of the other of said parts being connected to said one plate and the other end thereof wound to at least the first of a pair of integral pulleys free to rotate about a vertical axis; one end of at least one secondary cable being connected to the second plate and the other end thereof being wound to the second of the pair of pulleys; and a resilient element provided for the purpose of urging the two plates towards each other.

7. A device according to claim 6, wherein the diameter of the first pulley is three times that of the second.

8. A device according to claim 1, wherein the drive mechanism consists of an axial rod mounted in bearing means adapted to prevent said rod to move axially in relation to the ski but to allow said rod to rotate, said rod having two sections with opposite threads engaging

respectively in trheaded holes in said front and rear plates.

9. A device according to claim **8,** wherein the pitch of the thread on one of the threaded sections is three times that of the other.

10. A device according to claim **1,** further comprising locking means ensuring that said plates are locked in relation to each other when said drive mechanism is out of action.

11. A device according to claim **10,** wherein the locking means is the drive mechanism.

12. A device according to claim **1,** wherein said drive mechanism comprises at least one speed-reducing element designed to co-operate with at least one of said plates to allow said one plate to be driven at a speed differing from that of the other plate.

13. A device according to claim **1** wherein one of said plates is provided with an index means adapted to cooperate with said reference position.

14. A device according to claim **1,** wherein said control means includes a knob rotatably mounted on said housing.

* * * * *