(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 819 454 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.01.1998 Bulletin 1998/04

(51) Int Cl.[6]: **A63C 9/00**

(21) Application number: **97305127.9**

(22) Date of filing: **11.07.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(30) Priority: **18.07.1996 JP 189120/96**
26.02.1997 JP 42180/97

(71) Applicant: **Nagamina, Kenzo**
Yokohama City, Kanagawa Prefecture (JP)

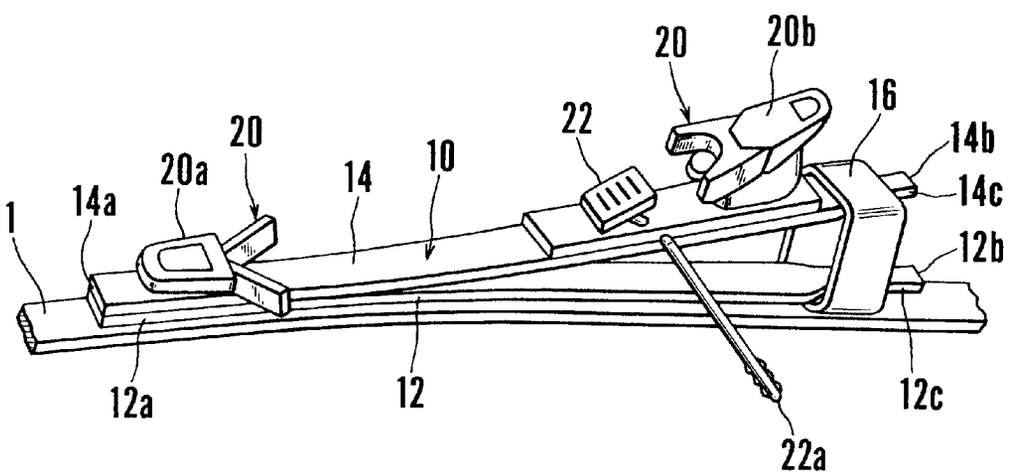
(72) Inventor: **Nagamina, Kenzo**
Yokohama City, Kanagawa Prefecture (JP)

(74) Representative: **Piésold, Alexander J.**
Frank B. Dehn & Co.,
European Patent Attorneys,
179 Queen Victoria Street
London EC4V 4EL (GB)

(54) Auxilliary apparatus for a ski

(57) The invention provides Auxiliary apparatus (10) for a snow ski which comprises: a V-shaped elastic body having a first plate spring (12) and a second elastic plate spring (14), and a restraining member (16), said first elastic plate spring (12) being integrally provided on a ski plate (1), a rear free end portion (14b) of said second elastic plate spring being vertically movable, and said restraining member being integrally fixed on said ski plate at a rear end portion (12b) of said first elastic plate whereby vertical lift can be generated between an upper ski surface and a ski boot (40) in order to obtain greater control and stability for a skier running on an uneven snow surface.

FIG. 1



EP 0 819 454 A1

Description

This invention relates to auxiliary apparatus for a ski.

It has been necessary for many skiers, even including some who are relatively experienced, to bend their knees softly to absorb a shock and vibration from the uneven snow surfaces and also to decrease resistance between their ski plates and the snow surface.

A skier usually skis on the snow surface with a slouch. A ski boot is originally locked between a toe binding and a heel binding so as to maintain a safe posture of the skier and to determine a correct direction of the skiing.

As shown in FIGS. 16a and 16b, a skier whose knees are rather stiff cannot bend his knees softly (an angle θ_1 of the skier's knee shown in FIG. 16a is equal to an angle θ_2 of that shown in FIG. 16b)

The bottom surface of the ski plate 1 has been waxed to improve its gliding surface and to decrease resistance between the ski plate 1 and the snow surface.

On the other hand, as shown in FIGS. 17a and 17b, another skier having soft knees can bend his knees to absorb a shock and vibration delivered from the uneven snow surfaces. The angle θ_4 of the skier's knee shown in FIG. 17b is smaller that the angle θ_3 of that shown in FIG. 17a).

When a skier tries to absorb vibrations and shocks from the snow surfaces by bending his knees by himself, there is a difficult problem that he cannot maintain his slouch for long hours due to his muscular and physical strength.

There has been another problem that many skiers, even including beginners or some who are relatively experienced, can neither glide on an uneven steep slope smoothly and at full speed, nor enjoy smooth skiing.

It is known that a running ski plate is usually subject to a composite vibration which includes a vertical curve vibration shown by a broken line (A) in FIG. 20a and a torsional vibration shown by a broken line (B) in FIG. 20b.

In order to control the composite vibration acting on the running ski, it has been proposed to provide a vibration absorber in or at the front or mid portion of the ski plate 1.

A conventional vibration absorber for a snow ski can control or absorb the composite vibration of the ski 1 itself, but it cannot control the vibration acting on a skier's feet.

Accordingly, it has been proposed to use a device having a vibration absorber and a heart-wood element for absorbing shock and vibration caused by uneven snow surfaces (see the Japanese Utility Model Publication No. 23318/1994).

In accordance with the conventional vibration absorber shown in FIGS. 19a to 19c, however, a longitudinal cavity 7 is formed in a central heart-wood plate 2 to locate at a ski boot 40, a vibration absorbing material 8 having a thin layer and an independent heart-wood element 9 having a shape corresponding to the cavity 7 is inserted into the cavity 7, and is integrally sandwiched between a top ski plate 4 and the middle heart-wood plate 2 so that the thickness of the ski 1 inevitably becomes larger, thus making it difficult to generate a sufficient lift for the ski boots and also to maintain the strength of the ski plate. The heel binding 20 is firmly fixed on the ski.

One of the biggest disadvantages of the conventional device is that due to the increased thickness, the ski cannot achieve independent flexibility of the various parts of the ski itself.

According to one aspect of the present invention, there is provided an auxiliary apparatus which comprises: a V-shaped elastic body having a first elastic plate and a second elastic plate, and a restraining member, said first elastic plate being integrally provided on the ski plate, a rear free end portion of said second elastic plate being vertically movable, and said restraining member being integrally fixed on the ski plate to locate at a rear end portion of said first elastic plate whereby vertical lift can be generated between an upper ski surface and a ski boot in order to obtain greater control and stability for a skier running on the uneven snow surfaces.

Preferably, an insert is integrally sandwiched between the front end portions of the elastic first and second plates so that greater lifting elasticity can be produced between the elastic first and second plates in order to absorb the shock and vibration of the ski plates caused by uneven snow surfaces.

Viewed from another aspect, the invention provides an auxiliary apparatus which comprises a pair of first and second plate springs, both side edges of which are restricted inwardly to form a narrowed portion adjacent their end portions so that their vertical and torsional movements can be properly controlled.

Still another aspect of the invention is to provide an auxiliary apparatus which comprises a pair of first and second plate springs, wherein a toe binding, a heel binding and a ski stopper can be provided on the second plate spring.

A further aspect of the invention is to provide an auxiliary apparatus which can be secured on the conventional ski plate without troublesome improvement therefor.

Preferably the restraining member is rectangular.

Preferably the rear free end portion of the second elastic plate is capable of vertical oscillation.

Viewed from another aspect the invention provides auxiliary apparatus for a ski, comprising a lower longitudinal portion for attachment to a ski, and an upper longitudinal portion the rear of which is resiliently upwardly biased from the rear of the first longitudinal portion so as to be spaced therefrom, whereby in use the spacing is reducible against the resilient bias in response to an upward force exerted on the ski.

Preferred embodiments of the invention will now be described by way of example only, and with reference to the accompanying drawings in which:

FIG. 1 is a partial perspective view of an embodiment showing a ski plate and a first auxiliary apparatus provided on the ski plate;
FIG. 2 is a partial side elevation of the first embodiment of the auxiliary apparatus shown in FIG. 1;
FIG. 3 is a partial plan view of the auxiliary apparatus shown in FIGS. 2 and 3;
FIG. 4 is a partial plan view of the auxiliary apparatus shown in FIGS. 2 and 3, from which a toe binding and a heel binding are removed;
FIG. 5 is a partial side elevation, partly in section, of the auxiliary apparatus shown in FIG. 4;
FIG. 6 is a side elevation of the auxiliary apparatus taken out from the embodiments shown in FIGS. 1 - 5;
FIG. 7 is a partial side elevation, partly in section, of the first auxiliary apparatus shown in FIGS. 1 - 6, on which a ski boot is mounted;
FIG. 8 is a partial side elevation, partly in section, of an embodiment showing a ski plate and a second auxiliary apparatus provided on the ski plate;
FIG. 9 is a perspective view of the exploded parts of the auxiliary apparatus shown in FIG. 8;
FIG. 10 is a partial side elevation of the auxiliary apparatus provided on the ski plate shown in FIGS. 8 and 9;
FIG. 11 is a partial side elevation, partly in section, of an embodiment showing a ski plate and a third auxiliary apparatus provided on the ski plate;
FIG. 12 is a partial side elevation, partly in section, of an embodiment showing a ski plate and fourth auxiliary apparatus provided on the ski plate;
FIG. 13 is a side elevation of the auxiliary apparatus taken from the embodiment shown in FIG. 12;
FIG. 14 is a partial side elevation, partly in section, of an embodiment showing a ski plate and a fifth auxiliary apparatus provided on the ski plate;
FIG. 15 is a side elevation of the auxiliary apparatus taken from the embodiment shown in FIG. 14;
FIG. 16a is a schematic illustration showing a skier running on a flat snow surface;
FIG. 16b is a schematic illustration showing a skier running on an uneven snow surface, with his stiff knee not being sufficiently bent;
FIG. 17a is a schematic illustration showing a skier running on a flat snow surface, with his sufficiently soft knees;
FIG. 17b is a schematic illustration showing a skier having sufficiently soft knees and running on an uneven snow surface;
FIG. 18a is a schematic illustration showing a skier running on a flat snow surface with the auxiliary apparatus of this invention;
FIG. 18b is a schematic illustration showing a skier running on an uneven snow surface, with his stiff knees not being sufficiently bent, with auxiliary apparatus of this invention;
FIG. 19a is a schematic illustration showing the exploded parts of a conventional ski having a shock absorbing device;
FIG. 19b is a schematic illustration showing conventional ski having a shock absorbing device;
FIG. 19c is a schematic sectional view of the shock absorbing device shown in FIGS. 19a and 19b;
FIG. 20a is a schematic illustration showing the vertical vibration of a ski; and
FIG. 20b is a schematic illustration showing the torsional vibration of a ski.

Referring now to the accompanying drawings in which like reference numerals designate like parts throughout the several views thereof, there is shown in FIGS. 1 - 15 a first embodiment of an auxiliary apparatus 10 provided on the ski plate 1.

The V-shaped elastic auxiliary apparatus 10 comprises a pair of lower and upper plate springs 12 and 14, the front portions 12a and 14a of which are integrally secured to each other, and a restraining member 16 to be provided on the ski plate 1 so as to locate at a ski boot 40 in such a way that narrowed rear end portions 12c and 14c are freely enclosed within the restraining member 16 to allow easy vertical oscillations of the lower and upper plate springs 12 and 14.

It should be understood that the lower plate spring 12 is slightly movable in a longitudinal direction along the ski plate 1.

As shown in FIG. 6, the angle between the lower and upper plate springs 12 and 14 becomes progressively wider towards the rear of the plate springs.

In FIGS. 8 - 10 showing the second auxiliary apparatus of this invention, an insert 18 is sandwiched integrally between the top end portions 12a and 14a of the lower and upper plate springs 12 and 14.

As shown in these drawings, both side portions of the lower and upper plate springs 12 and 14 are restricted so as to form narrowed portions 12c and 14c so that the rear end portions 12b and 14b can be freely inserted into the restraining member 16.

In another embodiment of this invention, an elastic auxiliary apparatus 10 having a lower plate spring 12 and an upper plate spring 14 is secured to the ski plate 1 and positioned so as to extend between a toe binding 20a and a heel binding 20b so that a bottom surface near the heel binding 20b can be pushed upwardly to absorb the shock and vibration acting on a skier's feet from the snow surface.

At the same time, resistance between the ski plate 1 and the snow surface can be decreased in order that a skier having rather stiff knees can ski on uneven snow surfaces with greater stability and at full speed.

The lower plate spring 12 is mounted on the upper surface of the ski plate 1 to locate the V-shaped front

portion of the elastic auxiliary apparatus 10 at the toe binding 20a so that the bottom surface near the heel of the ski boot 40 is pushed upwardly, and the upper plate spring 14 is made to produce elasticity in order to flex the ski plate 1 toward the snow surface.

More particularly, as shown in FIG. 7, the lower plate spring 12 is mounted on the ski plate 1 at the toe binding 20a, and the restraining member 16 is secured to the ski plate 1 at the heel binding 20b so that the rear end portions 12b and 14b of the lower and upper plate springs 12 and 14 may be freely enclosed within the restraining member 16.

As explained in the foregoing paragraphs, the elastic auxiliary apparatus 10 comprises a pair of lower and upper plate springs 12 and 14, their front end portions 12a and 14a being integrally combined with each other so as to produce elasticity making the other free end portions 12b and 14b flex relative to one another so as to separate them from each other.

It will thus be seen that the rear end portions 12b and 14b of the lower and upper plate spring 12 and 14 are freely inserted into the restraining member 16 of the V-shaped elastic auxiliary apparatus 10 to allow easy vertical oscillations of the lower and upper plate springs 12 and 14, thus absorbing shock and vibration given to a skier's feet from the uneven snow surface.

In another embodiment of this invention, an elastic auxiliary apparatus 10 having a lower plate spring 12 and an upper plate spring 14 is secured to the ski 1 and is positioned so as to extend between a toe binding 20a and a heel binding 20b in order to flex the ski plate 1 toward the snow surface.

In accordance with the auxiliary apparatus 10 for a snow ski enabling the resistance between a ski plate 1 and the snow surface to be decreased, and also to facilitate smooth skiing, a V-shaped elastic auxiliary apparatus 10 having a lower plate spring 12 and an upper plate spring 14 is located between the ski plate and the bottom surface of the ski boot 40, and the front portion of the lower plate spring 12 is secured on the upper surface of the lower ski plate 1.

It should be understood that the V-shaped auxiliary apparatus 10 is mounted between a toe binding 20a and a heel binding 20b on the ski plate 1, the upper plate spring 14 is made to lift the bottom surface near the heel of the boot 40, the toe portion thereof acting as a fulcrum, and the lower plate spring 12 is made to produce elasticity so as to flex the ski plate 1 toward the snow surface.

Referring to FIG. 6, the V-shaped elastic auxiliary apparatus 10 has a pair of plate springs 12 and 14, the front end portions 12a and 14a being integrally combined with each other and having elasticity making the other free end portions 12b and 14b flex relative to one another so as to separate from each other.

Referring again to FIGS. 1 and 2, the combined front end portions 12a and 14a of the elastic auxiliary apparatus 10 are secured longitudinally with respect to the ski so as to be positioned at a ski boot position on the upper surface of the ski plate 1, and the more widely spaced rear free end portions 12b and 14b are located within a restraining member 16 so that their transverse motion may be limited, and the lower plate spring 12 can be forced to move longitudinally in accordance with a flexible ski plate 1.

The V-shaped elastic auxiliary apparatus 10 comprises a lower plate spring 12 and an upper plate spring 14, and the restraining member 16 can be mounted on the ski plate 1. The combined front portions 12a and 14a are secured on the ski plate 1 to locate at the toe binding 20a, and the restraining member 16 is provided on the ski plate 1 to be positioned at the heel binding 20b so that the narrowed rear end portion 12c is freely inserted into the restraining member 16 to allow longitudinal vibrations of the lower plate spring 12.

It should be appreciated that the rear end portions 12b and 14b of the V-shaped elastic auxiliary apparatus 10 are bent outwardly, thus being separated from each other. The width of each of the lower and upper plate springs 12 and 14 is almost the same as that of the ski plate 1, and these plate springs have a sufficient rigidity to withstand torsion.

In FIG. 9 showing the second embodiment of this invention, the binding 20 has a toe binding 20a and a heel binding 20b, and four screw openings 14d are provided on the upper spring plate 14 to locate at the position of the toe binding 20a, four screw openings 18d are provided on an insert 18 at the corresponding positions of the four screw openings 14d, and also four screw openings 12d are provided on the lower plate spring 12 at the position of the toe binding 20a.

The lower plate spring 12 is placed on the ski plate 1 so as to align its screw openings 12d with the corresponding screw openings 1d of the ski plate 1.

The insert 18 is placed on the front portion of the lower plate spring 12, and subsequently the front portion of the upper plate spring 14 is mounted in such a manner that the screw openings 14d, 18d, 12d and 1d are aligned with one another, the screw bolts 19 are screwed into these screw openings so that the front portions of the lower plate spring 12 and the upper plate spring 14 are integrally secured to each other with the insert 18 sandwiched between them. Provided at the rear end portion of the heel binding 20b is a slit 17 extending in the forward direction through a middle portion thereof, and a set screw 19 is screwed upwardly into the slit 17 and also into a screw opening 20c in the heel binding 20b so as to secure the heel binding 20b to the upper plate spring 12.

In consequence, the position of the heel binding 20b can be adjusted longitudinally by moving of the set screw 19.

Referring again to FIG. 9, mounted on the ski plate 1 is the lower plate spring 12, the toe binding 20a being located on a front portion thereof. The insert 18 is placed on the front portion 12a, the upper plate spring 14 is then

mounted on the lower plate spring 12 so as to locate a front portion 14a on the insert 18, and the screw bolts 19 are screwed into the corresponding screw openings 14d, 18d, 12d and 1d in order to secure these portions integrally.

The restraining member 16 has a rectangular frame 16a including an upper transverse portion 16b and a pair of transverse bottom plates 16c having a pair of screw openings 16d provided at the transverse bottom plates 16c.

The restraining member 16 is mounted at the position of the heel binding 20b on the ski plate 1, and the screw bolts 19 are screwed into screw openings 16d in the bottom plates 16c and into the screw openings 1d in order to secure the restraining member 16.

As shown in FIGS. 1, 2, 5, 7, 8 and 9, a ceiling of the upper transverse portion 16b of the restraining member 16 is angled upwardly in the rearward direction so that the rear end portion of the upper plate spring 14 may be moved without causing any trouble to the restraining member 16.

The width of the restraining member 16 is substantially the same as that of the upper surface of the ski plate 1.

In FIGS. 2 and 3, the ski plate 1 having the auxiliary apparatus 10 and the binding 20 is illustrated respectively. In the embodiment shown in FIG. 2, wherein the ski boot 40 is not mounted on the ski, a ski stopper 22 is provided on the heel binding 20b in a manner that the ski stopper 22 can rotate so as to direct its lower end portions 22a downwardly.

With the elastic auxiliary apparatus 10 mounted on the ski plate 1, the position for securing the binding 20 is slightly lifted, but the ski of the invention is designed in such a way that the lower end portions 22a of the ski stopper 22 can extend downwardly sufficiently to locate below a lower surface of the ski plate 1 when the ski plate 1 is disengaged accidentally from the ski boot 40, thus enabling to stop the ski plate 1 on the snow surface.

As shown in FIGS. 2, 5, the upper plate spring 14 gives a force of bending the ski plate 1 upwardly at the front portion 14a of the upper plate spring 14 and when making contact with the restraining member 1-6 which acts as a fulcra.

On the other hand, the lower plate spring 12 gives a force of bending the ski plate 1 downwardly at the front portion 12a of the lower plate spring 12 and with the rear portion 12b acting as a fulcra.

In consequence, the action of the upper plate spring 14 bending the ski plate 1 upwardly is cancelled by the action of the lower plate spring 12 bending the ski plate 1 downwardly so that an originally designed bowed curvature of the ski plate 1 may be maintained without deteriorating the elasticity of the ski plate 1.

Even when a skier's weight acts on the auxiliary apparatus 10, the ski plate 1 is not deformed downwardly. When shock and vibration act on the ski plate 1 due to the snow surface, in addition to the skier's weight, the space between the lower and upper ski plate springs 12 and 14 is narrowed to absorb the shock and vibration.

In this way, shock absorption by the skier's knees is assisted by the auxiliary apparatus 10 so that the skier whose muscular and physical strength has declined can ski on the rough snow surface easily, smoothly and at high speed.

When the skier is skiing down the rough snow surface, the ski plate 1 itself moves up and down along the snow surface, but the shock and vibration are absorbed by the auxiliary apparatus 10 so as to restrain an up-and-down motion of the skier's body.

In other words, kinetic energy is not consumed for the up-and-down motion of the skier's body, thus preventing decrease of the skiing speed instead.

This is due to the fact that only the front end portions 12a and 14a of the lower and upper plate springs 12 and 14 are secured on the ski plate 1, and the rear end portions 12b and 14b thereof are loosely located within the restraining member 16.

If both of the front portions 12a and 14a, and the rear end portions 12b and 14b were rigidly secured on the ski plate 1, the latter could not bend itself freely by the lower and upper plate springs 12 and 14, resulting in deteriorating elasticity of the ski plate 1.

It can be well understood that only the front portions 12a and 14a of the plate springs 12 and 14 of the auxiliary apparatus 10 described in the drawings are directly secured on the ski plate 1 and the rear end portions 12b and 14b are slidably inserted into the restraining member 16 so that the ski plate 1 can bend itself freely without losing elasticity of the plate springs 12 and 14.

Since the width of the upper plate spring 14 is substantially the same as that of the inner length of the restraining member 16, transverse vibrations of the upper plate spring 14 are restrained by the restraining member 16.

In addition, the width of both of the lower and upper plate springs 12 and 14 is substantially the same as that of the ski plate 1, and they are made of material having a high rigidity to torsion so that the lower and upper plate springs 12 and 14 are not twisted, thus enabling the skier to exhibit a desired excellent biting edge of the ski plate 1.

Referring to the third embodiment shown in FIG. 11, an auxiliary apparatus 10 is mounted on the ski plate 1 independently of the toe binding 20a, and more particularly the front portion of the auxiliary apparatus 10 is provided on the ski plate 1 to locate at the rear of the toe binding 20a.

In this embodiment, the length of both of the lower and upper plate springs 12 and 14 is shorter than that of the embodiments shown in FIGS. 1 - 10.

A plurality of screw openings 1d are provided at a toe binding position on the surface of the ski plate 1.

For mounting, the binding 20 is adjusted to an optimum position on the ski plate 1, and its toe binding 20a is screwed onto the ski plate 1. The position for mounting

the auxiliary apparatus 10 is adjusted to standardize the ski boot 40 at the toe binding 20a.

In the embodiment shown in FIG. 11, only the heel binding 20b is secured to the auxiliary apparatus 10, and the toe binding 20a is mounted on the ski plate 1 so that an allowable range of size of ski boot 40 can be adjusted as desired.

It is possible in this embodiment not to form a long slit in the ski plate 1 for mounting the heel binding 20, thereby preventing a possible decrease of rigidity in the plate springs 12 and 14.

With reference to the fourth embodiment of this invention shown in FIGS. 12 and 13, the auxiliary apparatus 10 is a plate spring which is curved at a mid portion into a U-shaped front portion 12a (or 14a) to form a lower plate spring 12 and an upper plate spring 14. A plurality of screw openings 12d and 14d are provided in the straight portions of the lower and upper plate springs 12 and 14.

As in the former embodiments, both of the side portions 12c and 14c adjacent the rear end portions 12b and 14b of the lower and upper plate springs 12 and 14 are transversely restricted so that the narrowed portions 12c and 14c may be freely inserted into the restraining member 16 provided at a position of the heel binding 20b.

The screw bolts 19 are inserted through the screw openings 14d and screwed into the screw openings 12d and 1d in order to secure the lower plate spring 12 to the upper plate spring 14.

As shown in FIG. 12, a toe binding 20a is provided on the front portion of the upper plate spring 14, the lower plate spring 12 being integrally mounted on the upper surface of the ski plate 1.

Referring to FIGS. 14 and 15 showing the fifth embodiment of this invention, an auxiliary apparatus 30 comprises a narrowly looped spring including a narrowly spaced front portion 30a and a widely spaced rear portion 30b, and a plurality of screw openings 30d formed in an upper plate portion and a lower plate portion of the looped spring 30.

In addition, a pair of screw openings 30d are formed in the upper plate for securing a heel binding 20b, and both of the side portions 30c of the rear portions of the lower and upper plate springs 30c are transversely narrowed to allow easy insertion into the restraining member 16.

As shown in FIG. 14, the narrowly spaced front portion 30a of the looped auxiliary apparatus 30 is integrally secured to the ski plate 1 and positioned at the toe binding 20a which is provided on the front portion of the auxiliary apparatus 30.

Provided on the ski plate 1 is a restraining member 16 at the rear of the position for securing the heel binding 20b of the auxiliary apparatus 30. For mounting the looped auxiliary apparatus 30, an insert 18 is filled into a front portion of the former to enable the integral securing on the ski plate 1.

The heel binding 20b is provided on the wide spaced rear portion 30b, and a pair of the screw bolts 19 are screwed upwardly through and into the screw openings 30d and 20d in order to secure the heel binding 20b on the looped auxiliary apparatus 30.

As it is illustrated in the embodiment shown in FIGS. 14, only the narrowly spaced front portion 30a of the auxiliary apparatus 30 is secured on the ski plate 1 and the transversely narrowed portions 30c are freely inserted into the restraining member 16 so that the desired lifting of the heel position of the ski boot 40 may be obtained without losing the designed flexibility of the ski plate 1.

In view of the fact that the narrowly spaced front portion 30a of the auxiliary apparatus 30 is secured on the ski plate 1 with the insert 18 being located in the narrowly spaced front portion 30a, the space between the upper and lower plates in the narrowly spaced front portion 30a is not reducible.

Accordingly, snow and ice hardly enter into the narrowly spaced front portion 30a, and even if they do, it is easy for the skier to remove them, thus maintaining the designed flexibility of the ski plate 1 without any change during skiing.

In comparison to the embodiments shown in FIGS. 1 - 10, wherein 2 sheets of the lower and upper plate springs 12 and 14 are combined, the construction of the auxiliary apparatus 30 is simple so that it is easily manufactured, and mechanical problems can be avoided.

Since the widely spaced rear portion 30b of the auxiliary apparatus 30 is closed, having a looped configuration in section and a high rigidity to torsion, there is a possibility of exhibiting the desired edging effect of the ski plate 1.

It can be seen that the closed widely spaced rear portion 30b of the looped auxiliary apparatus 30 is freely inserted into the restraining member 16 so that the desired lifting of the heel position of the ski boot 40 may be obtained without losing the designed flexibility of the ski plate 1.

In accordance with the above embodiments, the shock and vibrations acting on the bottom face of the ski boot 40 from the snow surface can be absorbed by the auxiliary apparatus 10 or 30 which is mounted between the ski surface and the ski boot 40, extending assistance in the absorbtion of the shock and vibration by the soft knees of the skier and also to decrease the burden on the skier.

As a result, a decline in muscular power of the skier and the consumption of the physical strength of the skier can be decreased, resulting in maintaining safe, smooth, and high speed skiing for long hours.

It is shown in FIG. 18a that the skier equipped with the auxiliary apparatus 10 is skiing on the flat snow surface, while it is shown in FIG. 18b that he is skiing on the rough or uneven snow surface.

In accordance with the auxiliary apparatus 10 of this invention, an unexpected sudden shock given to a skier

can be safely controlled irrespective of his skill of skiing.

It can be well appreciated that the skier equipped with the auxiliary apparatus 10 can ski on the flat or uneven snow surface, irrespective of his stiff or soft knees, safely, smoothly and at high speed by a vertical lift generated between the upper ski surface and the bottom of the ski boot 40.

It will therefore be seen that at least in the preferred forms of the invention, vertical lift can be generated between an upper ski surface and a ski boot in order to obtain greater control and stability for a skier running on an uneven snow surface, and the skier can obtain the capacity of the skis to conform flexibly to the uneven snow surfaces.

Claims

1. Auxiliary apparatus (10) for a snow ski which comprises: a V-shaped elastic body having a first plate spring (12) and a second elastic plate spring (14), and a restraining member (16), said first elastic plate spring (12) being integrally provided on a ski plate (1), a rear free end portion (14b) of said second elastic plate spring being vertically movable, and said restraining member being integrally fixed on said ski plate at a rear end portion (12b) of said first elastic plate whereby vertical lift can be generated between an upper ski surface and a ski boot (40) in order to obtain greater control and stability for a skier running on an uneven snow surface.

2. Auxiliary apparatus (10) for a snow ski as claimed in claim 1, wherein said first plate spring (12) is a lower plate spring and said second elastic plate spring (14) is an upper plate spring.

3. Auxiliary apparatus (10) for a snow ski as claimed in claim 1 or 2 further comprising an insert (18) sandwiched between the front portions (12a, 14a) of the first (12) and second (14) plate springs.

4. Auxiliary apparatus (10) for a snow ski as claimed in any of claims 1 to 3, wherein said restraining member (16) has a rectangular frame (16a) having a pair of bottom plates (16c), the upper transverse portion (16b) of said rectangular frame being angled upwardly in the rearward direction to allow easy movement of a rear portion of said second elastic plate spring (14).

5. Auxiliary apparatus (10) for a snow ski as claimed in any of claims 1 to 4, wherein the front portions (12a, 14a) of the V-shaped elastic body are mounted on the ski plate (1) to locate at a rear position of a toe binding (20a).

6. Auxiliary apparatus (10) for a snow ski which comprises: a U-shaped elastic body having a first plate spring (12) and a second elastic plate spring (14), and a restraining member (16), said first elastic plate spring being integrally provided on a ski plate (1), a rear free end portion (14b) of said second elastic plate spring being vertically movable and said restraining member being integrally fixed on said ski plate to locate at a rear end portion (12b) of said first elastic plate, whereby vertical lift can be generated between an upper ski surface and a ski boot (40) in order to obtain greater control and stability for a skier running on an uneven snow surface.

7. Auxiliary apparatus (10) for a snow ski as claimed in claim 6, wherein said first plate spring (12) is a lower plate spring and said second elastic plate spring (14) is an upper plate spring.

8. Auxiliary apparatus (10) for a snow ski which comprises: a looped spring (30) including a narrowly spaced front portion (30a) and a widely spaced rear portion (30b), and a plurality of screw openings (30d) formed in an upper plate portion and a lower plate portion of said looped spring, a pair of screw openings formed in the upper plate for securing a heel binding (20b), both of said side portions (30c) of the rear portions of the lower and upper plate springs being transversely restricted to form a narrowed portion, said narrowly spaced front portion of said looped auxiliary apparatus being integrally secured to the ski plate (1), a toe binding (20a) being provided on the front portion of said auxiliary apparatus, an insert (18) being sandwiched between said upper and lower plate portions in said front portion of said looped auxiliary apparatus, and a restraining member (16) being provided at the heel binding position on the ski plate in such a manner that the rear portion of said looped auxiliary apparatus is freely insertable into said restraining member.

9. Auxiliary apparatus (10) for a ski, comprising a lower longitudinal portion (12) for attachment to a ski, and an upper longitudinal portion (14) the rear (14b) of which is resiliently upwardly biased from the rear (12b) of the first longitudinal portion so as to be spaced therefrom, whereby in use the spacing is reducible against the resilient bias in response to an upward force exerted on the ski.

10. A ski provided with auxiliary apparatus (10) as claimed in claim 9.

FIG. 1

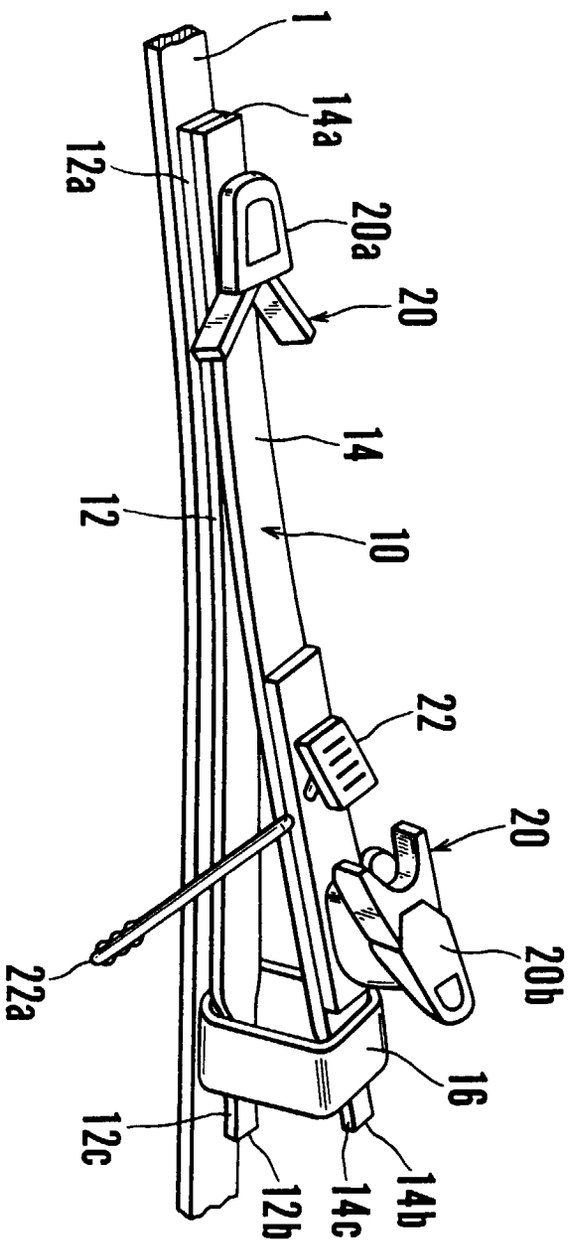


FIG. 2

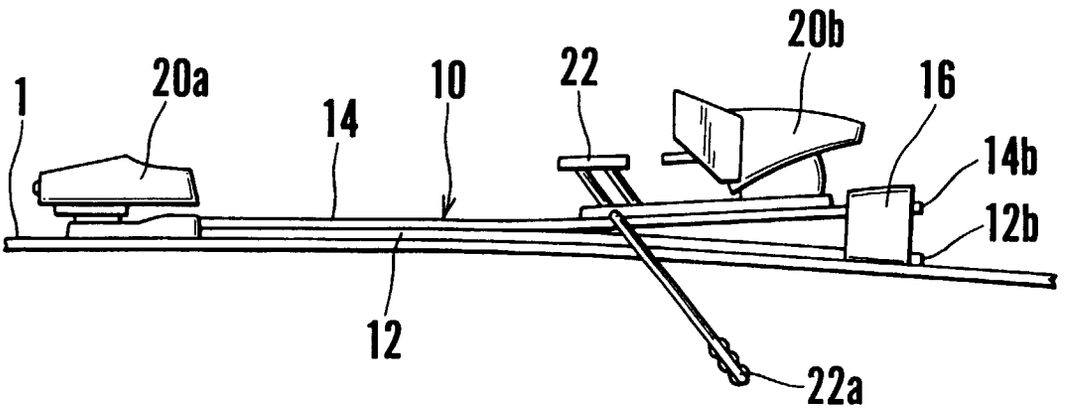


FIG. 3

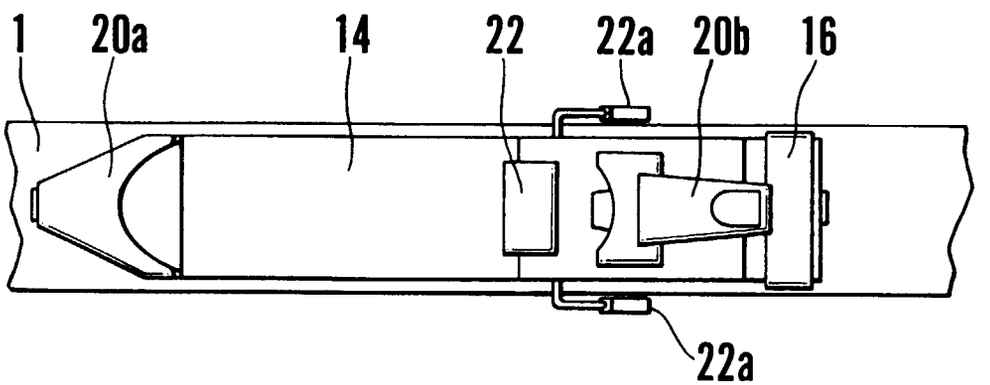


FIG. 4

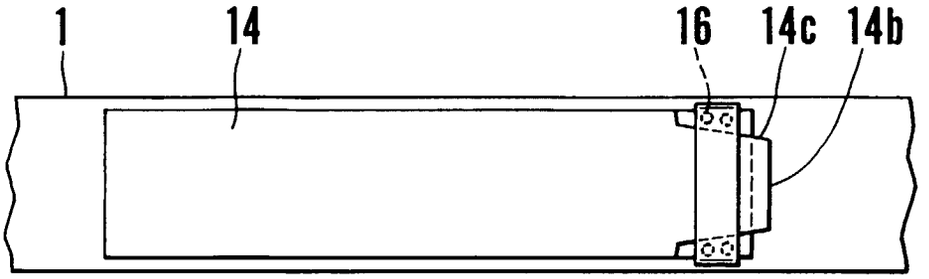


FIG. 5

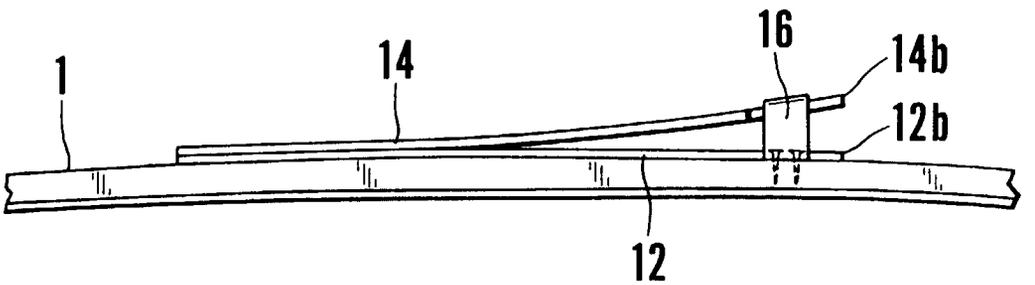


FIG. 6

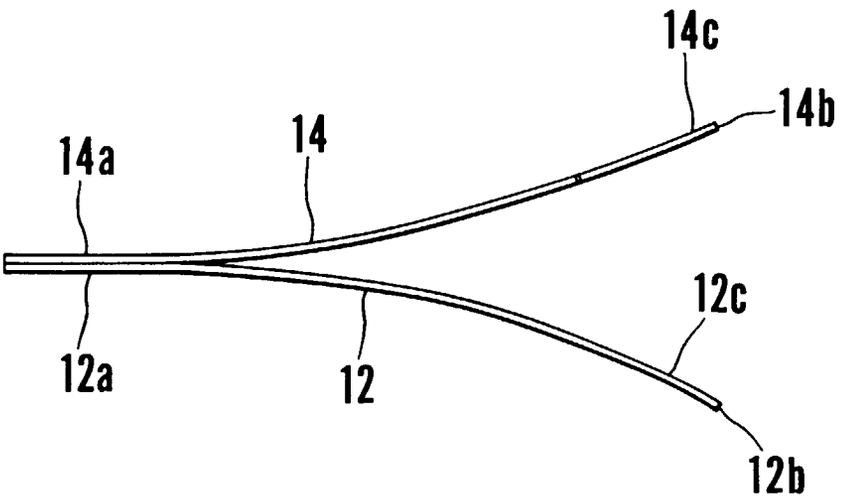


FIG. 7

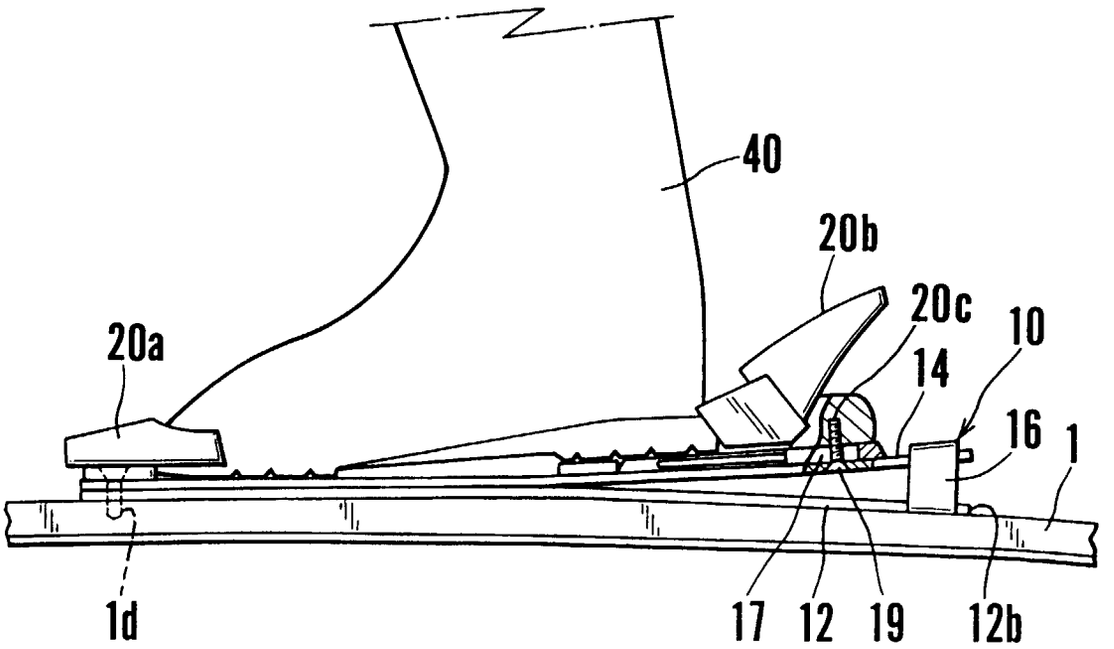

40
20b
20c
10
20a
14
16
1
1d
17
12
19
12b

FIG. 8

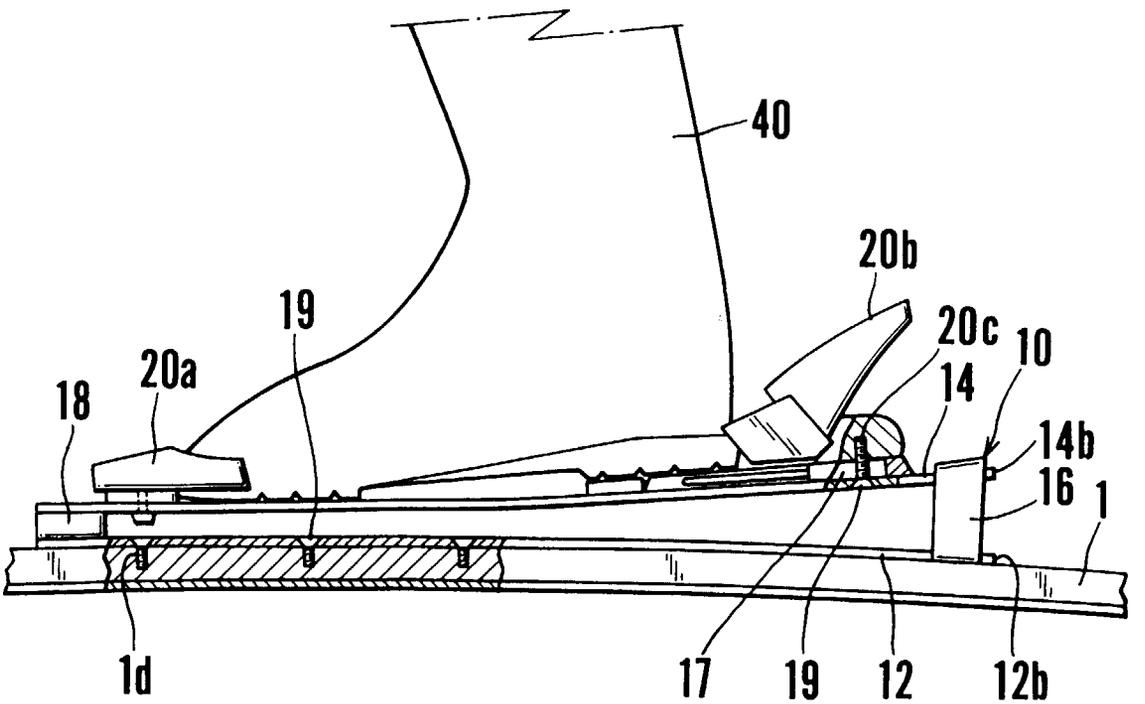

40
20b
19
20c
10
20a
14
18
14b
16
1
1d
17
19
12
12b

FIG. 9

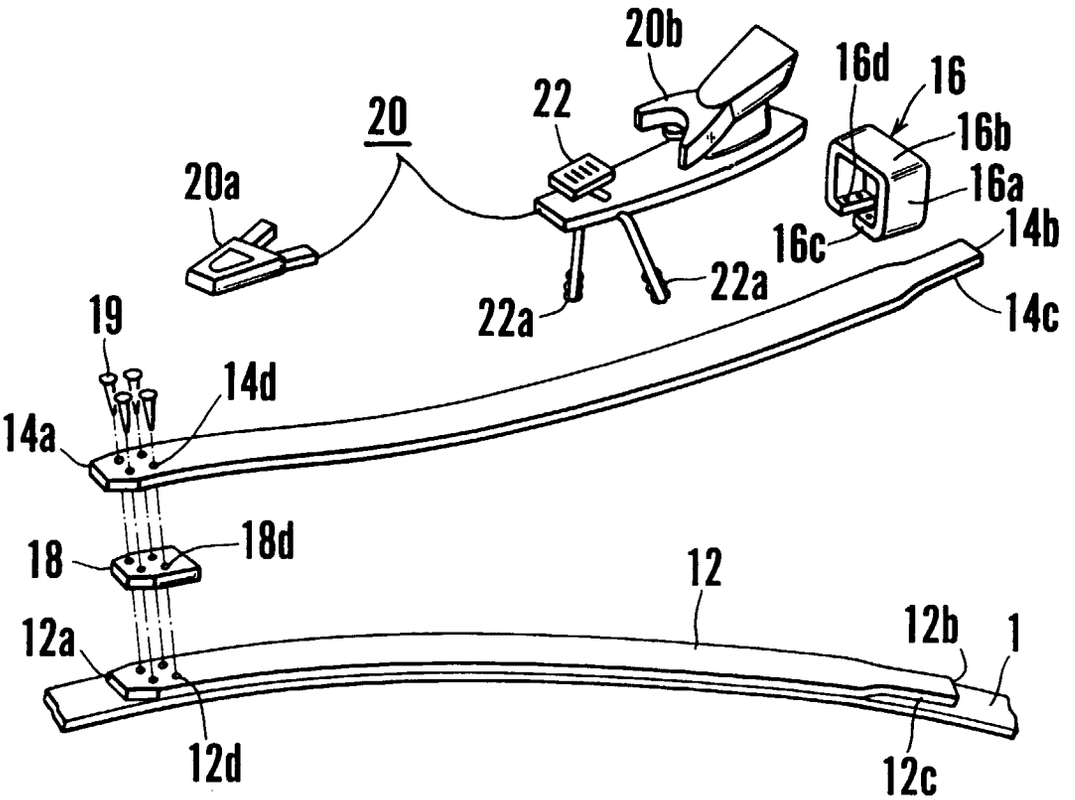

20b
16d
16
20
22
16b
20a
16a
16c
14b
22a
22a
14c
19
14d
14a
18
18d
12
12b
1
12a
12d
12c

FIG. 10

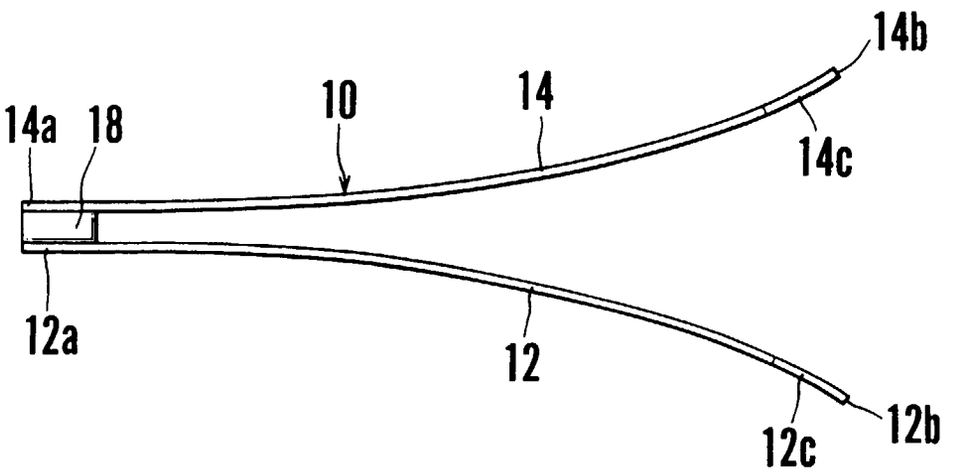

14b
10
14
14a
18
14c
12a
12
12b
12c

FIG. 11

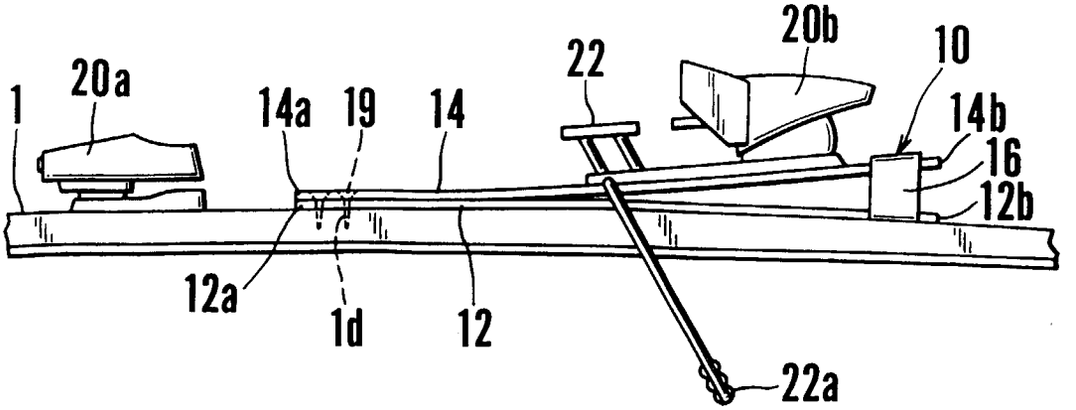


FIG. 12

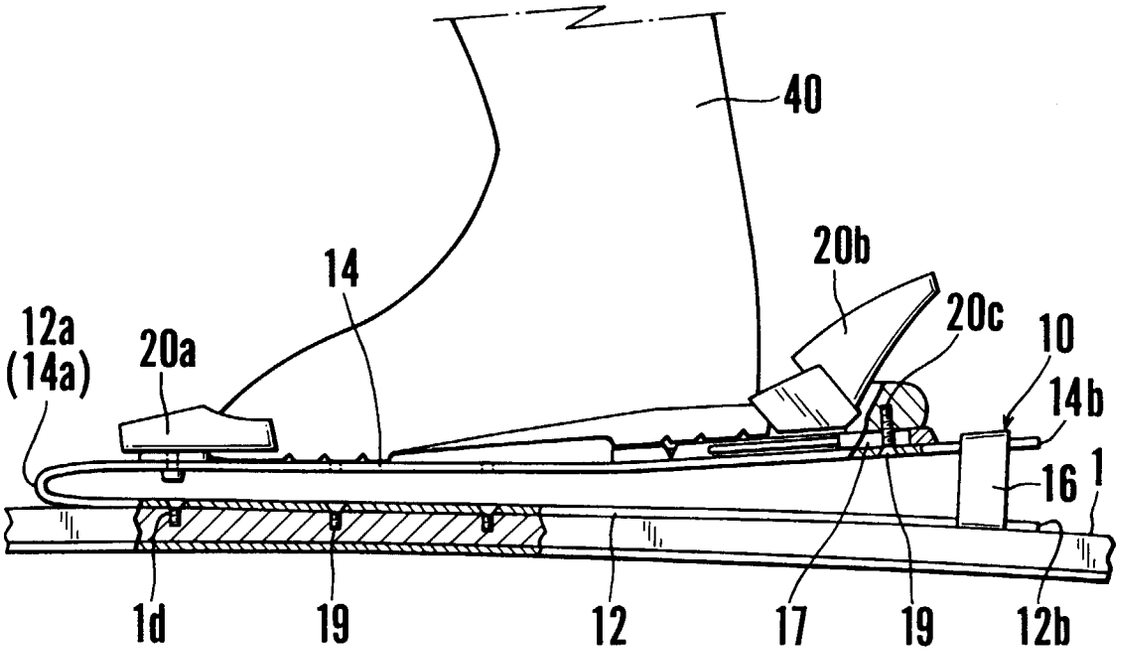
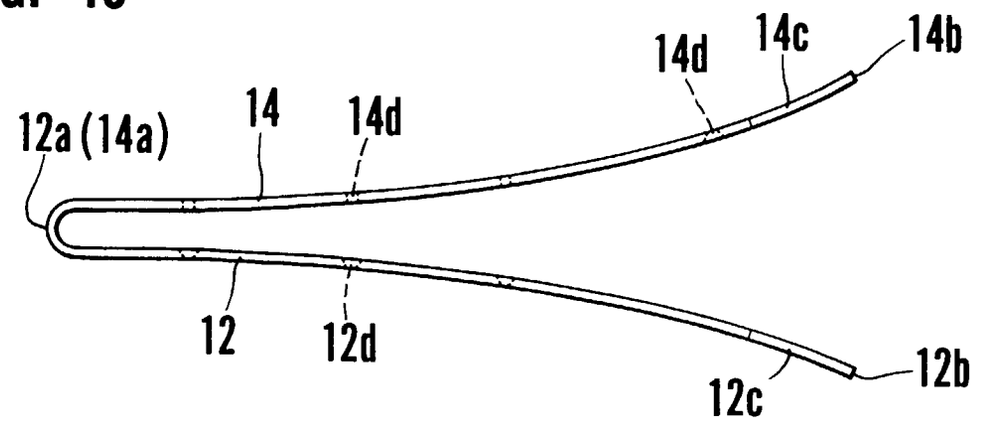


FIG. 13



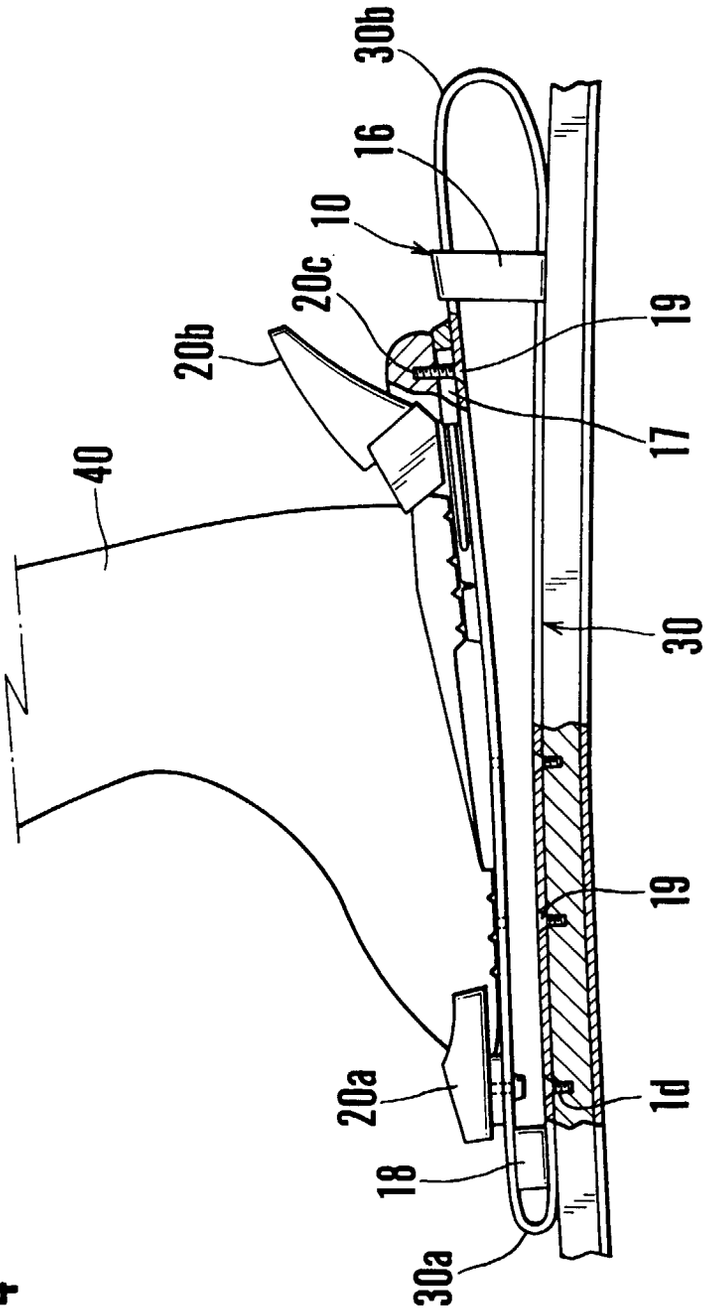

30b
16
10
20c
20b
19
17
40
30
19
20a
1d
18
30a

FIG. 14

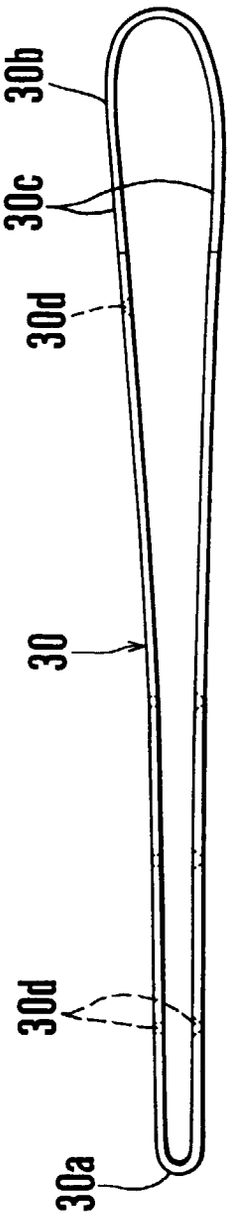

30b
30c
30d
30
30d
30a

FIG. 15

FIG. 16b

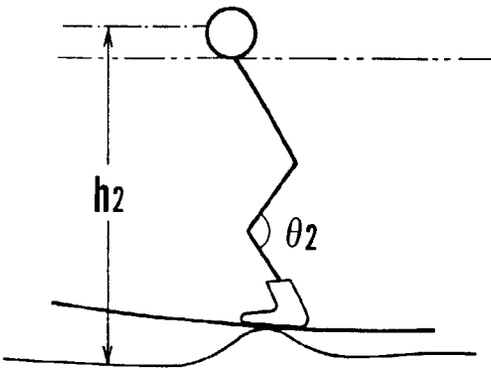
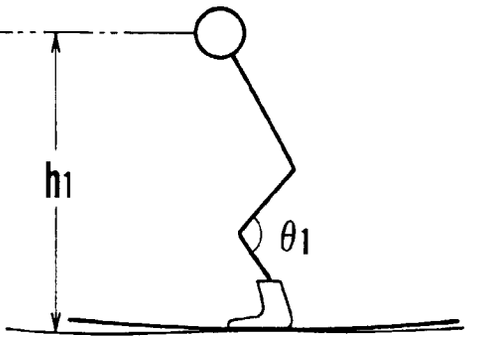


FIG. 16a



$h_2 > h_1$ $\theta_2 = \theta_1$

FIG. 17b

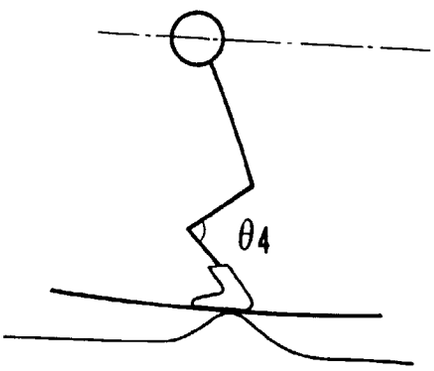
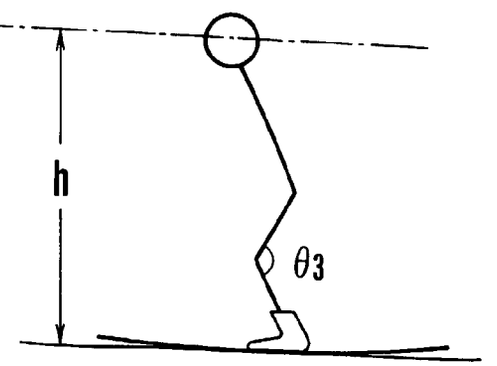


FIG. 17a



$\theta_4 < \theta_3$

FIG. 18b

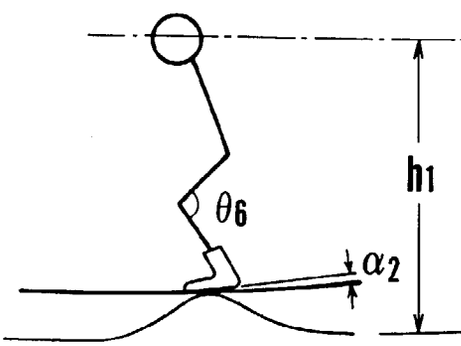


FIG. 18a

$\theta_4 < \theta_6 \leqq \theta_5$

FIG. 19a

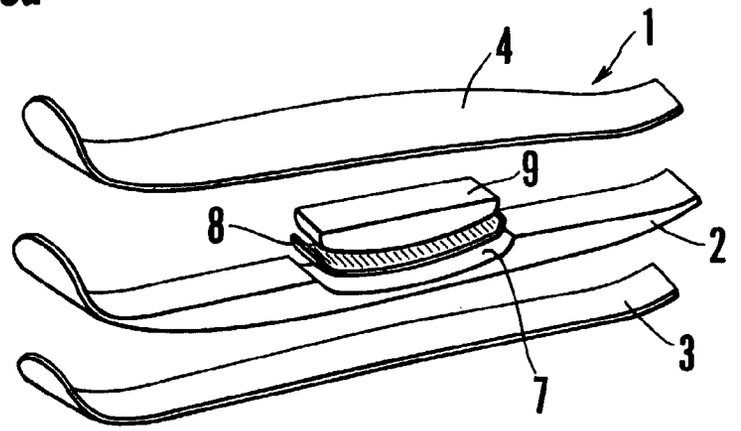


FIG. 19b

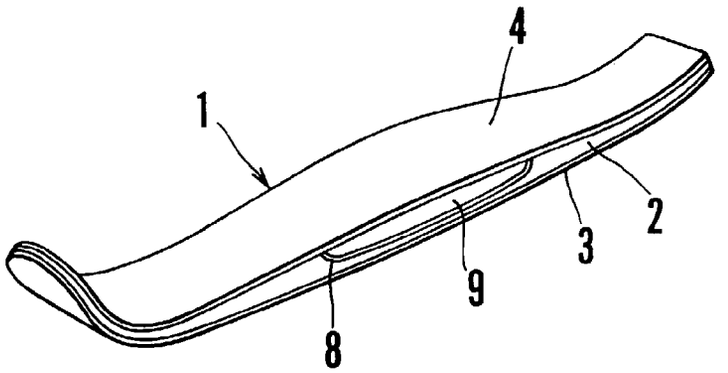


FIG. 19c

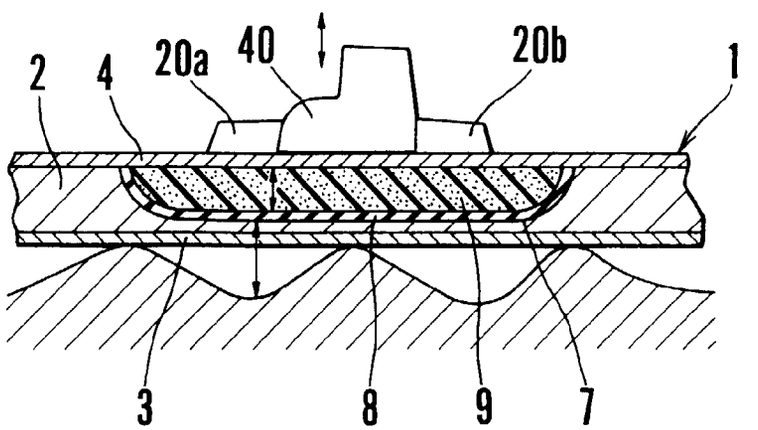


FIG. 20a

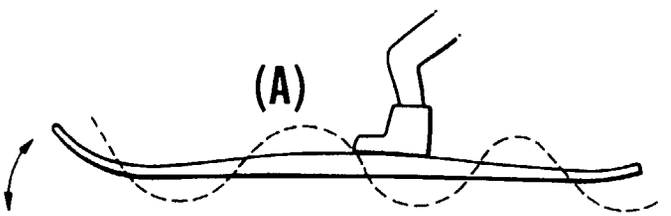
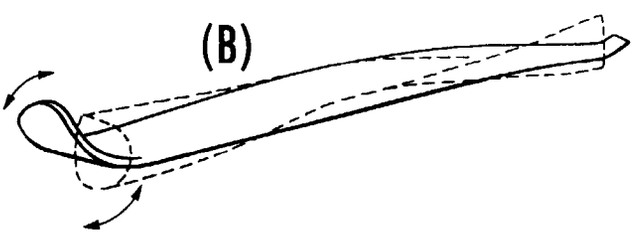


FIG. 20b



European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 97305127.9

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
A	US 4139214 A (MEYER) 13 February 1979 (13.02.79), fig. 4,5,6. --	1,3,5, 6,8	A 63 C 9/00
A	EP 0230989 A2 (MEYER) 05 August 1987 (05.08.87), abstract. ---	1,6,8	
A	WO 83/03360 A1 (GERBER) 13 October 1983 (13.10.83). --		
A	US 5431427 A (PIEBER) 11 July 1995 (11.07.95). ----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 6)
			A 63 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	03-10-1997	LEBZELTERN

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)