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(54) **Ski binding with a spring as flexor**

(57) The present disclosure describes a ski binding (1), in particular for a touring or cross country ski (2). In particular, the invention relates to the provision of a spring

(20) with at least one extension (21) to be used as a flexor portion. Additionally, in order to connect a ski boot (5) to the ski binding (1) in a satisfactory manner, a rotatable hooked locking portion is provided.

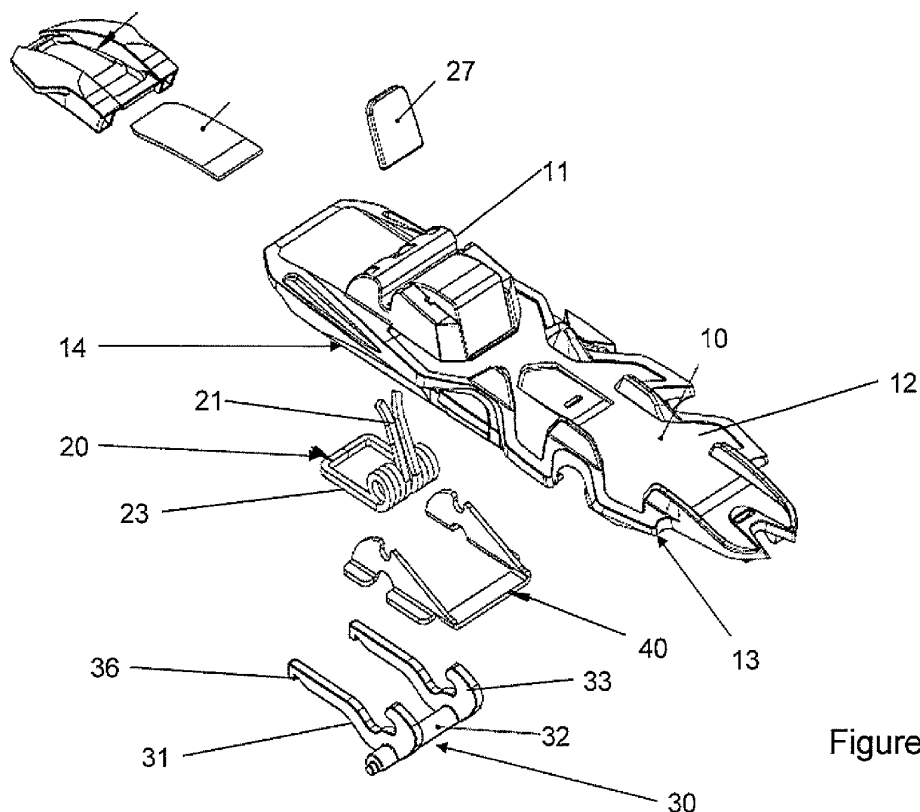


Figure 2

Description**BACKGROUND TO THE INVENTION**

[0001] Skiing, and in particular cross-country or touring skiing, is a popular winter pursuit for many people. As is well known, in order to enjoy this sport properly, it is necessary to have appropriate equipment. In particular, the skis and ski bindings for cross-country and touring skiing must provide an appropriate fastening of the skier's boot to the ski, whilst also allowing the heel of the boot to leave the surface of the ski.

[0002] It is well known in the art to provide some form of base plate or binding plate which has the required fastening mechanism to interact with the ski boot of the skier. In particular, the ski boot for cross-country and touring skiing will typically have a rotation point underneath the toe of the boot, which must clip into an appropriate housing on the ski binding. The housing allows the pin to be attached in a rotatable manner, primarily by holding onto the pin of the ski boot in a rotatable manner.

[0003] As can be seen from the above, it is necessary to provide a fastening mechanism which will allow the base plate to removably attach the ski boot, and in particular the rotation pin of the ski boot, in a rotatable fashion. Typically, a slot or channel is provided in the upper surface of the base or binding plate, and the rotation pin slots into this. Once the rotation pin is within this slot or channel, a mechanism will close off the channel thus holding the ski boot in place. A variety of different mechanisms are available, but typically these require several moving parts which increases both the complexity of the ski binding, as well as its eventual weight and cost.

[0004] It is also necessary in ski bindings of this sort to provide some form of flexor which will generally act to force the ski boot into contact with the upper surface of the ski or binding. That is, when the ski is being used, the boot rotates around the fixing point, and the heel of the boot leaves the surface of the ski. In order to allow for an improved and safe skiing technique, it is necessary that the boot and ski be forced back together, such that the heel will generally be biased towards being brought into contact with the upper surface of the ski.

[0005] Typically, in order to achieve the above described return force, a flexor is provided against which the toe of the ski boot will act. This flexor is usually provided forward of the channel or slot receiving the rotation pin of the ski boot, and thus when the ski boot is rotated the toe of the ski boot will lead to compression of the flexor. Obviously, the compressed flexor, or the like, will then lead to a restoring force to try and rotate the ski boot and ski back into contact.

[0006] A variety of solutions have been presented for providing this flexor unit, many of which are also quite large thus impacting on the general size and weight of the ski binding. There exists a need for a simple and small flexor unit, which can give the required rotation force, but without incurring excess weight and increased size of the

binding plate.

SUMMARY OF THE INVENTION

[0007] The abovementioned problems with regard prior art flexors and fastening mechanisms have been addressed in the present application, and solutions are given in the appended independent claims 1 and 8 respectively. Further advantageous combinations and designs are given in the dependent claims therefrom.

[0008] In particular, a ski binding is provided which is suitable for use with a cross-country or a touring ski. Such a ski binding utilises a base or binding plate which is suitable for attachment to the upper surface of a ski. This can either be directly to the ski, or by means of a mounting plate appropriately fashioned to interact with the base plate. In particular, the base or binding plate is provided with the necessary structure to allow removable attachment of a ski boot, and will fasten the ski boot to the base plate in a rotatable manner. In order to provide the required rotation force, the base plate is advantageously provided with a spring which will act as a flexor. In particular, the spring is provided with one or more extensions which are positioned forward of the ski boot fixing mechanism on the base plate. By positioning the extension forward of the fixing point, the toe of the ski boot when attached to the base plate will rest against the extension. When the ski boot is rotated around its fixing point, the toe of the boot will press against the extension, and lead to the extension rotating. The spring is fixed within the base plate in such a manner that the spring itself will not rotate upon force applied to the extension, rather the spring will be put under tension by such motion. By fashioning and holding the spring in this manner, such that rotation of the extension will lead to greater tension being put into the spring, it is clear that this will lead to a general force attempting to rotate the ski boot back into contact with the base plate.

[0009] The above suggested design is simple in its construction, yet effective. By providing a single spring unit with an extension, the number of parts required is reduced to simply one. Furthermore, the spring can be fastened within the base plate so as to provide the necessary holding such that the force on the extension will lead to a tightening of the spring rather than a rotation of the entire unit, thus giving the necessary return force. Obviously, the spring can be held in a removable manner, such that different springs could be incorporated within the base plate such that the return force could be tailored to the individual user.

[0010] A particular and advantageous design for the spring, is one which comprises a torsional spring. In particular, the torsional spring has an extension extending from the wound spring section, such that rotation of the extension will lead to the tightening of the wound spring section, and a general tensioning in the spring. In order to stop the rotation of the spring, it is possible to provide some form of base or stand as a resilient means against

which the force of rotation on the extension can act. By having the spring such that it will stand on these resilient means or base, it is clear that a force acting on the extension will stop the spring from rotation by means of the base or stand. Further, this will also lead to the tensioning of the spring element, rather than rotation of the spring.

[0011] This is particularly useful as a design, as it means that the spring unit can be self-contained. Further, such a design means that the top surface of the ski, or the mounting plate in between the ski and the base plate, can be used as the surface against which the spring will act. In other words, the spring unit need only be held or sandwiched between the base plate and the ski or mounting plate, in order to generally hold the spring in position, and then the base or mount will provide the necessary interaction with the upper surface so as to stop rotation of the spring, and allow it to be put under tension by rotation of the extension.

[0012] In order to allow the spring to be combined with the base plate in the above described manner, it is useful to provide a recess in the underside of the base or binding plate. In particular, this will lead to an extension on the upper side of the base plate, which can be used to form the ski boot receiving slot or channel. In particular, the recess in the base plate will obviously form a cavity when the base or binding plate is attached to the ski, such that the cavity can be used to house the spring. Further, by structuring the cavity accordingly, the above described advantage of having the base of the spring held on the upper surface of the ski or mounting plate can be achieved, thus allowing the spring a surface against which to act when rotation of the extension is provided.

[0013] A variety of different options exist for providing the spring, although it is particularly useful to provide this with a single rod or wire-like piece of material, as this reduces the number of parts and the complexity of the design. In particular, the design could be provided with two legs at either end of the rod-like material, wherein these legs lead into sections of a wound spring portion, and at the centre of the wound spring portion is provided the extension. Alternatively, the extension could be provided by either end of the wire-like material, and this then lead into the wound spring portions which then loop round to join each other to form the base or resilient portion.

[0014] Obviously, it is necessary for the base plate to be provided with a slot at the appropriate point to allow the extension to pass through from the underside of the plate. This is achieved at a position forward of the ski boot holding section, so that the extension will be provided at the appropriate point to interact with the toe of the ski boot.

[0015] Finally, it is clear that the ski boot toe will have to run up and down the extension when the ski boot is rotated. In order to improve this action, it is possible to provide the extension with a displaceable cover, such that the toe of the ski boot will remain fixed in relation to the cover, and the cover will slide up and down on the extension. This will stop any frictional forces from build-

ing-up between the extension and the toe of the boot, and will also improve the comfort for the skier.

[0016] A further ski binding design relates to the provision of an appropriate fastening mechanism for the binding. In particular, a fastening mechanism is discussed which can be structured with two elongate arms connected by means of a connecting bar. This design will lead to a mechanism structured as an "H". By allowing the fastening mechanism to rotate generally within the binding, it is possible that at one end of the elongate arms hook fasteners could be provided which will then be used to hook and hold the bar of the ski boot in place. In particular, the hook fastener mechanism can be positioned within the base plate, such that rotation generally around the connecting bar will lead to hooked portions at one end of the elongate arms overlapping the slot provided in the base plate for holding the connecting and rotation bar of the ski boot. Rotating the hook fastening mechanism in the other direction, will then obviously lead to the opening of the slot which will allow for the ski boot to be removed.

[0017] The above design is obviously simple in its construction, as it requires the provision of only one additional part into the base plate or binding plate. That is, the H-shaped fastening mechanism. By allowing the locking to proceed by means of a simple rotation of this fastening mechanism, the ease of use and simplicity of the design is greatly improved. Further, because only one simple mechanism is provided, the size of the base plate can also be reduced.

[0018] As has been discussed above, the base or binding plate is typically provided with a recess therein. It is of clear advantage if the recess is also usable by the fixing mechanism, such that the one recess is required for holding both the spring and the hook fastener. The cavity can once again be structured to hold the hook fastener in place, and provide the appropriate rotation fitting which will allow the hook portions at one end of the connector to open and close the slot for receiving the ski boot.

[0019] In order to allow for such a mechanism to function, the base plate can be provided with a plurality of slots at the appropriate position. In particular, one series of slots is provided near the ski boot receiving section, such that the hooked portions of the rotatable fastener can pass from the underside of the base plate and overlay the slot or channel. Additionally, to allow the other ends of the fastener to extend out from the inside of the recess or cavity formed therewith, further slots are provided which will allow the extension arms to pass there-through. The slots for the extension arms or elongate arms will allow the arms to rotate thus moving the fastener between the two orientations, one being the opening of the channel or slot the other being the closing thereof.

[0020] In order to further strengthen and improve the design, it is possible to provide a holding plate for attaching and positioning the rotatable fastener within the binding plate. Further, the holding plate can be used to interact with the slot or channel for the ski boot fixing mech-

anism, which will also strengthen the section of the binding or base plate, and further improve the safety of the device. That is, the ski boot is generally provided with a metal pin for providing the fixing and rotation mechanism, and if this interacts with a holding plate, possibly made from metal, there will be a metal on metal connection which will obviously provide a secure and rigid fastening. Further, the holding plate can be provided with indents in its lower surface, which can be used to position and accommodate the connecting bar of the rotatable fastening mechanism. In this way, the holding plate can interact with the binding or base plate, and hold the fastener in position.

[0021] In order to provide the connection and interaction with the ski boot channel, the holding plate can be provided with indents in its upper surface, which will generally follow the contour of the slot or channel in the base plate. Furthermore, by providing the upper indents in line with the lower indents, the rotation point of the fixing hook mechanism is advantageously positioned with respect to the slot in the base plate, and thus a simple rotation of the hook-like mechanism will appropriately open and close the channel or slot in the base plate.

[0022] A further advantage is that the hook-like fixing mechanism can be provided in a bi-stable manner. That is, the hook-like fastener has two preferred orientations within the base or binding plate, one is with the slot open, and the other is with the ski boot slot closed. In order to move between each of these two orientations, a resistive force is achieved by structuring the hook-like fastener with an over-centre locking portion. That is, at the rotation bar, the thickness of the elongate arms increases slightly, such that the protrusion must be rotated passed the surface of the ski or mounting plate in order to move the hook-like fastener between the two preferred orientations. This will clearly improve the security of the device, as it will mean that the fastening mechanism does not accidentally open when the ski is in use.

[0023] In order to achieve this bi-stable fixing mechanism, the hook-like fastener can be provided with two flat surfaces either side of the rotation point. These two flat surfaces will provide the two stable configurations, while also providing that the thickness of the elongate arms increases around the rotation point. As the hook-like fastener will be held within the binding or holding plate in such a manner that the flat surfaces lie on the surface of the ski or the mounting plate, the protrusion must be forced passed the mounting plate or ski surface in order to rotate the fastener. This provides a very simple yet effective locking mechanism which will secure and reliably hold the fastener in one of the two stable orientations.

[0024] Finally, it is possible to combine both the above described features in a single ski binding. That is a ski binding comprising both the spring as flexor and the rotatable fixing or hook fastener.

DESCRIPTION OF FIGURES

[0025]

- 5 Figure 1: A perspective view of a ski binding of the present disclosure.
- Figure 2: An exploded view of the ski binding shown in Figure 1.
- Figure 3: A second exploded view showing different aspects of the ski binding shown in Figure 1.
- 10 Figure 4: Cut-away views through the ski binding shown in Figure 1.
- Figure 5: Cut-away view showing aspects of the fastening mechanism.
- 15 Figure 6: The fastening mechanism as shown in Figure 5.
- Figure 7: A perspective view of a holding plate.

DESCRIPTION OF KEY ASPECTS

- 20 **[0026]** Figure 1 shows a general perspective view of a ski binding 1 according to the present disclosure. In particular, this ski binding 1 is intended for use with either a cross-country or touring ski 2. Also shown in this figure is the ski 2 to which the ski binding 1 is intended for attachment. Obviously, the ski binding 1 is not an integral part of the ski 2, rather it forms a replaceable additional part which can be attached to a ski 2.

- [0027]** Shown in Figure 1, is the ski binding 1 generally comprising a base plate 10. This base plate 10 is designed to fit on the upper surface 3 of the ski 2. The base plate 10 may attach directly to the upper surface 3 of the ski 2, or, as is well known in the art, the base plate 10 may attach to the ski 2 by means of a separate mounting plate 16. Such a mounting plate 16 is well known in the art, and any suitable mounting plate 16 is considered as appropriate for binding and allowing the base plate 10 to mount to the ski 2. As can be seen from Figure 1, the base plate 10 is structured with certain aspects which are well known for base plates 10 for cross-country or touring skis 2.

- [0028]** In particular, the base plate 10 is provided with a section for attaching a ski boot 5 of the skier to the base plate 10, and thus ski 2, in a removable manner. It is common for cross-country or touring skiers to have ski boots 5 which are possessed of a rotation pin or bar 4 on the underside thereof. This rotation pin 4 provides a mechanism by which the ski boot 5 can be attached to the ski binding 1, in particular the base plate 10, in a rotatable manner. It is important that the ski boot 5 rotates around the toe end of the ski boot 5, as when the skier is performing skiing, it is necessary to be able to lift the heel of the ski boot 5 from the upper surface 3 of the ski 2.

- [0029]** As is generally known in the art, a reliable mechanism of attaching a ski boot 5 to a base plate 10 is to have a slot in the upper surface 12 of the base plate 10. In particular, this slot will provide a ski boot receiving portion 11 which is structured to accommodate the rota-

tion pin 4 of the ski boot 5. In order to hold the ski boot 5 to the base plate 10, it is necessary to be able to close at least part of the opening to the slot or ski boot receiving portion 11 on the base plate 10. In such a manner, once the rotation pin 4 of the ski boot 5 has been positioned within the slot 11, the open section to the slot 11 can in some way be sealed, thus holding the rotation pin 4 within the slot 11 and fixing the ski boot 5 to the base plate 10.

[0030] Looking at Figure 1, the slot 11 can clearly be seen, and further the locking mechanism according to the present disclosure is also shown in its closed orientation. As can be seen in Figure 1, the open section of the slot 11 is closed off by means of two fastening means extending across the open section. Obviously, it is necessary for these fastening means to be moveable, so that the slot 11 can be opened and closed as desired. In the present disclosure, this mechanism is achieved by means of the hook-like fastener 30 as shown in Figures 2, 3 and 6. This hook-like fastener 30 is intended to be housed within base plate 10 in a rotatable and removable manner, and is further structured such that in one rotation orientation the ski boot receiving portion 11 is opened to allow the rotation pin 4 to be positioned therein, and in a second rotation the ski boot receiving portion 11 is closed and the ski boot 5 is locked to the base plate 10. In order to achieve this lockable mechanism, the present disclosure provides the rotatable hook-like fastener 30 for housing within the base plate 10.

[0031] In the present disclosure, the hook-like fastener 30 is held within a recess 14 provided in the base plate 10. In particular, this recess 14 is provided at the region of the ski boot receiving portion 11, and preferably can be used to actually define the ski boot receiving portion 11. That is, from the underside 13 of the base plate 10 a recess is seen, which leads to a protrusion on the upper surface 12 of the base plate 10. Within this protrusion the ski boot receiving section 11 may be formed, and the simplest way to form this is by having a slot sized and shaped to accommodate the rotation pin 4 of the ski boot 5. As can also be seen in several of the figures, the protrusion out of the upper surface 12 of the base plate 10 can be used to house a standard flexor which is intended to fit beneath the toe of the ski boot 5 when it is attached to the base plate 10. Such flexors are well known in the art, and it is not intended that the base plate 10 be restricted to any particular form of flexor, merely that it is possible to provide a housing means for the flexor by means of the protrusion from the upper surface 12 of the base plate 10.

[0032] As can be seen from Figures 1 to 3, it is possible to house the hook-like fastener 30 in the recess 14 on the underside 13 of the base plate 10. Housing the hook-like fastener 30 in such a recess 14 is desirable as it hides the locking mechanism and further protects this from external damage or accidental activation. As can best be seen in Figure 3, the region of the protrusion in the base plate 10 surrounding the ski boot receiving portion 11 is provided with at least one first slot 34, which

allows the appropriate portion of the hook-like fastener 30 to pass from the recess 14 out through the slot 34 to cover a section of the ski boot receiving portion 11 thus providing the locking section. As can be seen in Figure 3, the design shown has two such first slots 34 which are located at each end of the ski boot receiving portion 11. Obviously by having two locking mechanisms the strength of the binding between the base plate 10 and the ski boot 5 is improved.

[0033] As can be seen in both Figures 2 and 3 the hook-like fastener 30 desirably comprises a pair of elongate arms 31, which are attached to each other by connecting bar 32. As can further be seen in the figures, the connecting bar 32 is positioned along the length of the elongate arms 31, such that the general shape of the hook-like fastener is an H. In this way, the connecting bar 32, or region of the hook-like fastener 30 surrounding the connecting bar 32 can be used as the rotation point of the hook-like fastener 30. As is further clear from the figures, the hook-like fastener 30 has hooked portions 33 positioned at one end of the elongate arms 31, thus providing two hooked portions 33. In particular, each of the hooked portions 33 is provided at the same side with respect to the connecting bar 32. These hooked portions 33 are appropriately shaped such that when the hook-like fastener 30 is held in the recess 14 of the base plate 10, rotation of the hook-like fastener 30 will allow the hooked portions 33 to pass through slots 34 and thus close the ski boot receiving portion 11. By rotating the hook-like fastener 30 in this manner, it is clear that the ski boot receiving portion 11 can be open and closed, thus providing a fastening means for holding the rotation bar 4 of the ski boot 5 in the ski boot receiving portion 11.

[0034] In order to allow the user of the ski binding 1 to readily open and close this binding mechanism provided by the hook-like fastener 30, the elongate arms 31 are provided with rotation arms 36. These rotation arms 36 are at the other end of the elongate arms 31 from the hooked portions 33, and extend from the connecting bar 32. Obviously by applying a force to the rotation arms 36 the hook-like fastener 30 can be rotated, and thus the fastening mechanism for the ski binding 1 can be actuated. In order to allow the user of the ski access to the rotation arms 36, the base plate 10 is provided with one or more second slots 35. These second slots 35 are positioned such that the rotation arms 36 can pass there through. The second slots 35 are also provided to allow the movement of the rotation arms 36 in an upward and downward motion whilst the hook-like fastener 30 rotates around the connection bar 32. In other words, the hook-like fastener 30 is held with the connecting bar 32 rotationally connected to the base plate 10, and the rotation arms 36 pass through the second slots 35, and rotation of these rotation arms 36 is allowed by the shape of the second slot 35 thus allowing the hooked portions 33 to open and close the ski boot receiving portion 11.

[0035] As has been described above, the hook-like fastener 30 may be provided with two elongate arms 31. Of

course, it is also possible to provide the hook-like fastener 30 with one or more elongate arms 30, the main requirement being the number of first and second slots 34, 35. Of most interest, however, is the described example, wherein two elongate arms 31 are provided, as this leads to a satisfactory fastening of the ski boot 5 to the base plate 10, whilst also reducing the complexity of the design, and allowing for a good strength to the base plate 10. Further, the elongate arms 31 can be positioned at either side of the base plate 10, which allows for further aspects of the ski binding 1 to be placed within the gap between the elongate arms 31, thus allowing for a reduced size to the design.

[0036] As will be appreciated, if the hook-like fastener 30 is rotating around the connecting bar 32, it is desirable for this to be held underneath the ski boot receiving portion 11. That is, if the connecting bar 32 is under the ski boot receiving portion 11, rotation of the hook-like fastener will allow the hooked portions 33 to rotate most satisfactorily through the first slot 34 to open and close the ski boot receiving portion 11. Additionally, it is possible for the portion of the elongate arms 31 lying around the connecting bar 32 region of the hook-like fastener 30 to provide a resting surface for the rotation pin 4 of the ski boot 5. As can be seen most clearly in Figure 6a, there is a generally curved surface beneath the hook of the hooked portion 33, and when the hook-like fastener 30 is within the base plate 10, this curved surface lying above the connection bar 32 in Figure 6a, can be used as a part of the bottom part of the ski boot receiving portion 11, and the rotation pin 4 can rest upon such. With rotation of the hook-like fastener 30, the surface in this part of the hook-like fastener 30 will slide along the rotation pin 4, and will help guide the rotation pin 4 to be held by the hooks of the hooked portion 33.

[0037] One particular advantageous aspect of the hook-like fastener 30 is that this can actually provide a bistable orientation in the base plate 10. As is clear to the skilled person, it is desirable that the hook-like fastener 30 be held in either the open or closed orientation securely. In other words, the skier does not want the hook-like fastener 30 rotating whilst he or she is skiing, as this would lead to the opening and closing of the ski boot receiving portion 11 and would be quite dangerous. Further, to improve the ease of attaching the ski boot 5 to the base plate 10, the ski boot receiving portion 11 should preferentially be maintained in an open position until the ski boot 5 is in place, and then the skier can lock the fastening mechanism. The suggested manner of achieving this bi-stable rotation is best seen in Figure 6a.

[0038] As has been described above, the hook-like fastener 30 is intended to rotate around the connecting bar 32 region. By providing the lower surface of the hook-like fastener 30, or more particularly the elongate arms 31, in the region of the connecting bar 32 with two generally flat surfaces, it is possible to generate an over-centre locking mechanism. That is, the hook-like fastener 30 has two preferred orientations in which one or other of

the generally flat lower surfaces of the elongate arms 31 lie in contact with a lower surface. In order to rotate the hook-like fastener 30 from one to the other of the these rotations, the protrusion 39 which results from the joining of the two generally flat lower surfaces will tend to resist such a rotation motion. In particular, the hook-like fastener 30 will be held in the recess 14 to the base plate 10 in such a manner that in one or other of the stable orientations, the generally flat lower surface will lie on the upper surface of the ski 2 or the upper surface the mounting plate 16 attached to the ski 2. This can be seen in Figure 5. Clearly, this simple mechanism allows for a reliable fastening system by means of the above described hook-like fastener 30.

[0039] By housing the hook-like fastener 30 in the recess 14 of the base plate 10 such that it can rotate around the connecting bar 32 region, the described hook-like fastener 30 is positioned such that the two stable orientations are preferred. That is, that the generally flat underlying surfaces of the elongate arms 31 will rest against the upper surface of the ski 2 or mounting plate 16 and be firmly held by means of the rotational fixing portion or point in the base plate 10. In order to rotate the hook-like fastener 30 between these two orientations, will require some force to rotate the hook-like fastener 30 past the protrusion 39. This is generally possible, by allowing the slight deformation of the hook-like fastener 30 and base plate 10 during such a rotational motion. Obviously, once the protrusion 39 has passed by the hook-like fastener 30 will snap into either the open or closed orientation.

[0040] A further possibility, is to integrate a holding plate 40 with the ski binding 1. The holding plate 40 can be seen in Figures 2 and 7, and interacts with the hook-like fastener 30. In particular, the holding plate 40 may have lower indents 42 which are indented into a lower resting surface 41 of the holding plate 40. The resting surface 41 is preferably generally flat, such that the holding plate 40 can rest upon the top surface 3 of the ski 2 or on the mounting plate 16. Further, the lower indents 42 are sized and shaped to accept some portion of the connecting bar 32 of the hook-like fastener 30. In such a manner, the rotation point of the hook-like fastener 30 will be fixed at the connecting bar 32, and the operation of the fastening mechanism can be improved. As is further clear from the figures, an additional possibility is to provide the holding plate 40 with upper indents 43. Preferably, these upper indents 43 lie directly above the lower indents 42, and these can be used to form part of the ski boot receiving portion 11 in the base plate 10. By providing the holding plate 40 from a metal material, the strength of the ski boot receiving portion 11 can be improved, in particular with regards to flexing or stress by the user of the ski when the ski boot 5 is attached. Obviously, the rotation pin 4 of the ski boot 5 will, if resting on metal from the holding plate 40, be less likely to cause damage to the protrusion forming the ski boot receiving portion 11.

[0041] It is desirable for the base plate 10 to be struc-

tured such that the holding plate 40 is generally sandwiched between the lower surface 13 of the base plate 10 and the upper surface 3 of the ski 2 or mounting plate 16. That is, it is not necessary to fix the holding plate 40 to the base plate 10, rather it could be simply sandwiched between the base plate 10 and the ski 2. An alternative mechanism would be to have the holding plate 40 snap fitting into the underside 13 of the base plate 10 in some well known manner.

[0042] As can be seen in several of the figures, the hook-like fastener 30 could also have the connecting bar 32 extending out either side of the elongate arms 31. Indeed, this would allow for the extension points to the connecting bar 32 to interact either directly with the base plate 10 to form the point of rotation, or with the lower indents 42 of the holding plate 40. Again, this allows for the recess 14 to be rather more open, thus giving room for additional structure of the ski binding 1 to be incorporated therein. As is finally seen in Figure 6b, it is possible to provide the hook-like fastener 30 from three separate parts, namely the two elongate arms 31 and the connecting bar 32. Of course, it is also possible to provide the hook-like fastener 30 as a single integral piece.

[0043] It is possible for the first slot 34 of the base plate 10 to extend round such that the upper indents 43 of the holding plate 40 will align with the ski boot receiving portion 11. A further possibility is to provide a series of third slots 37 at the portions of the ski boot receiving portion 11 which would coincide with the upper indents 43 of the holding plate 40. In this way, it is not necessary to have one larger slot which could lead to a slight weakness of the base plate 10. As can further be seen in Figures 1 to 3, it is possible to provide the rotation arms 36 with a removable cover in order to provide a pressing surface which can be used by the skier to open and close the fastener. Desirably this would snap-fit onto the rotation arms 36, such that the pressing surface could be removed to allow removal of the hook-like fastener 30.

[0044] With the type of ski binding for cross-country or touring skis 2, it is desirable to have some mechanism of biasing the rotation of the ski boot 5 back such that the ski boot 5 is generally in contact with the top surface of the ski 2 or base plate 10. That is, as has been described above, the ski boot 5 is fixed in a rotatable manner to the base plate 10, and when the skier is cross-country skiing, the heel of the ski boot 5 will leave contact with the upper surface 3 of the ski 2. In order to improve the skiing action, it is desirable that the ski 2 be generally biased back toward the ski boot 5, and so as to bring the heel generally back toward the upper surface 3 of the ski 2.

[0045] Many well known alternatives exist for providing this return force to rotate the ski back into contact with the ski boot 5, the best being by means of a flexor. Often, the flexor units can be provided with, or by, a compressible rubber or plastic material, which rests at the toe portion of the ski boot 5. When the ski boot 5 rotates in the base plate 10, the toe of the ski boot 5 compresses the

flexor which will resist the force and generally will attempt to rotate the ski 2 back toward the ski boot 5. The present disclosure incorporates a spring 20 for providing the restoration force to rotate the ski boot 5 back into contact with the ski 2. The spring 20 is incorporated into the base plate 10 at a position forwards (considering the front of the ski 2 as being forwards) of the ski boot receiving portion 11. In this manner, when the ski boot 5 is attached to the base plate 10 the front of the ski boot will rest against an extension 21 of the spring 20. In particular, the extension 21 provides a flexor portion 22 against which the toe of the ski boot 5 will act with rotation of the ski boot 5. As will be understood, when the ski boot 5 is attached to the base plate 10 in such a way that the toe of the ski boot 5 rests against the extension 21 of the spring 20, rotating the ski boot 5 will push the toe portion of the ski boot into the extension 21 thus causing it to move. In particular, the spring 20 is so structured that rotation of the extension 21 leads to the spring 20 being placed under tension, and thus the spring will generally try to rotate the ski boot 5 back round and into contact with the base plate 10.

[0046] In the same manner as for the hook-like fastener 30, it is desirable for the spring 20 to be held within the recess 14 formed in the base plate 10. By having the spring 20 hidden from view, leads to a reduction in the likelihood of damage to the spring 20 by use of the base plate 10. With the spring 20 held within the recess 14, it is necessary to provide a spring slot 15 which will allow the extension 21 to pass to the outside of the recess 14 such that the boot 5 can rest thereupon. Again, this spring slot 15 should be provided forward of the ski boot receiving portion 11, so that the extension 21 is provided in the appropriate position on the base plate.

[0047] As can be seen in Figure 2 and 3, the spring 20 is provided with a base or resilient portion 22, which can be used to provide a stand for the spring 20. That is, both springs 20 shown in Figures 2 and 3 can be rested on a surface by means of the resilient means 23, such that the extension 21 will generally extend upward from the resilient means 23. Between the resilient means 23 and the extension 21 is provided the wound spring section 24, so as to be able to provide a tension force upon movement of the extension 21. The spring 20 functions by being placed within the recess 14 of the base plate 10. When in the recess 14, the extension 21 passes through the spring slot 15 and thus is extending out of the surface of the base plate 10. When the base plate 10 is positioned on the upper surface 3 of the ski 2 possibly by means of a mounting plate 16, the resilient means 23 will rest upon either the mounting plate 16 or the upper surface 3 of the ski 2. When held in this position, it is clear that a force directed onto the extension 21 will lead to the extension 21 moving, and thus putting the wound spring sections 24 under stress, as the resilient means 23 will be forced against the upper surface 3 of the ski 2 or the mounting plate 16. With the wound spring sections 24 under tension, it is clear that a return force will be generated to

generally move the ski boot 5 back into contact with the ski 2. As is further clear, the size and number of coils in the wound spring section 24 can be chosen so as to provide greater or lesser return forces. This is desirable as certain skiers may prefer a stronger return force than others.

[0048] As can be seen from the figures, the extension 21 is shown as being surrounding at either side by two sections of wound spring 24a, 24b. This is not necessary, and the extension could be provided at one end of a wound spring section 24, although it has been shown that the central design leads to a more stable return force. As is also shown in Figures 2 and 3, the spring 20 can be formed in a variety of different ways. The key feature of the spring 20 being, however, that a resilient means 23 will rest against the upper surface 3 of the ski 2 for mounting plate 16, and that the extension 21 will pass through the spring slot 15, such that upon the rotation of the ski boot 5 the force will be transmitted to the extension 21 which will lead to a tension being applied to the wound spring section 24.

[0049] The possible designs for the spring 20 are numerous, but two of the most reliable designs can be seen in each of Figures 2 and 3. In particular, the spring 20 is desirably formed from a single rod or wire-like piece of material. In one design the first end of the material can form one first leg 25a. This first leg 25a leads into a first portion of the wound spring section 24a which then leads into forming the extension 21. At the other side of the extension 21 a second wound spring section 24b is formed from the material which then leads to a second leg 25b. This design can be seen in Figure 3.

[0050] A second possibility, is that the end of the material forms one half 26a of the extension 21. This then leads into the first part of the wound spring section 24a round to the resilient means 23 which forms a looped base. The other end of this loop leads into the wound spring section 24b and then up to the second part of the extension 21. Of course, it is not necessary to have two parts to the extension 21, and further the first end of the material could form the complete extension 21 by means of a loop, which then leads round and the second of the material forms the second wound spring section 24b. As is clear, the possible designs are numerous, and the three above have been presented as non-limiting options thereof.

[0051] As with the hook-like fastener 30, the spring 20 may be sandwiched between the base plate 10 and the upper surface 3 of the ski 2. This can either be held in a simple sandwiched manner, or the spring could be clipped into the base plate 10 by means of the resilient means 23. Again, with fixing the spring 20 in such a way, the resilient means 23 would still act against the upper surface 3 of the ski 2, or the mounting plate 16.

A further possible feature to the spring 20 is the provision of a displaceable cover 27. Obviously as the ski boot 5 rotates around the ski boot receiving portion 11, the front of the ski boot 5 will rub up and down on the extension

21 of the spring 20. By providing a displaceable cover 27 on the extension 21, this can provide a stable and movable cover, such that the displaceable cover 27 moves in relation to the extension 21 but remains stationary with respect to the front of the ski boot 5. In so doing, this will lead to less wear on the ski boot 5, thus improving the operation of the ski binding 1 in general. Rather than having a displaceable cover 27, the extension 21 could be provided with a low slip surface, perhaps made from Teflon ® or the like.

[0052] Whilst the above features have been presented as forming an advantageous ski binding 1, it is clear that a ski binding 1 could be provided with either just the spring 20 or the hook-like fastener 30 as defined above. Further, the ski binding 1 could be provided with both of these two features, as they would both advantageously fit within the recess 14 of the base plate 10. This design provides for a simple and reliable mechanism of both returning the ski 2 into contact with the ski boot 5 by means of the spring 20, as well as efficiently clipping the ski boot 5 to the base plate 10. Finally, whilst features have been presented in combination in the above description, this is intended solely as perhaps an advantageous combination. The above description is not intended to show required combinations of features, rather it presents each of the aspects of the disclosure. It is not intended that any specific combination of features should be derivable as necessary for the functioning of the ski binding 1.

REFERENCE NUMERALS

[0053]

- 1: Ski binding
- 2: Ski
- 3: Upper surface of ski
- 4: Rotation pin
- 5: Ski boot
- 10: Base plate
- 11: Ski boot receiving portion
- 12: Upper surface of base plate
- 13: Lower surface of base plate
- 14: Recess
- 15: Spring slot
- 16: Mounting plate
- 20: Spring
- 21: Extension
- 22: Flexor Portion
- 23: Resilient means
- 24: Wound spring section
- 25: First & second leg
- 26: First and second portion
- 27: Displaceable cover
- 30: Hook-like fastener
- 31: Elongate arms
- 32: Connecting bar
- 33: Hooked portions
- 34: First slot

- 35: Second slot
- 36: Rotation arms
- 37: Third slot
- 38: Bend
- 39: Protrusion
- 40: Holding plate
- 41: Resting surface
- 42: Lower indents
- 43: Upper indents

Claims

1. A ski binding (1) for a cross country or touring ski (2), comprising :

a base plate (10) for attachment to the upper surface (3) of the ski (2) wherein the base plate (10) is structured with a ski boot receiving portion (11) for both accommodating the rotation pin (4) of a ski boot (5) and allowing rotation of the ski boot (5); wherein

the ski binding (1) further comprises a spring (20) which has at least one extension (21) providing a flexor portion (22), wherein the at least one extension (21) extends upward from the upper surface (12) of the base plate (10) at a position forward of the ski boot receiving portion (11), such that the front of a ski boot (5) attached to the base plate (10) would act upon the at least one extension (21) of the spring (20) on the occasion that the ski boot (5) were rotated around the ski boot receiving portion (11), thus putting the spring (20) under tension.

2. The ski binding (1) of claim 1, wherein the spring (20) is a torsional spring and is provided with resilient means (23) extending from a wound spring section (24), the resilient means (23) providing both a stand for the spring (20) and further the means for acting against the surface upon which the spring (20) is resting, so that upon a force action against the at least one extension (21) the spring will be stopped from rotating and instead the wound spring section (24) will be put under tension.

3. The ski binding (1) of claim 2, wherein the base plate (10) is provided with a recess (14) on the underside (13) thereof, which is large enough to house the spring (20) and which defines a cavity when the base plate (10) is attached to ski (2), such that when the spring (20) is in the cavity its resilient means (23) will rest upon the upper surface (3) of the ski (2) or on a mounting plate (16) attached to the upper surface (3) of the ski (2).

4. The ski binding of any of either one of claims 2 or 3, wherein the spring (20) is provided from a single

elongate wire-like material, which defines:

at a first end a first leg (25a) which leads into a first portion of the wound spring section (24a), the at least one extension (21) extending from the first portion of the wound spring section (24a) and then into a second portion of the wound spring section (24b) and then into a second leg (25b) at the second end of the elongate wire-like material, wherein the axis of the first and second sections of the wound spring section (24a, 24b) align and the first and second legs (25a, 25b) extend in the same direction to provide the resilient means (23).

5. The ski binding of any of either one of claims 2 or 3, wherein the spring (20) is provided from a single elongate wire-like material, which defines:

at a first end a first portion of the at least one extension (26a) which leads into a first portion of the wound spring section (24a), the resilient means (23) formed of a loop of material extending from the first portion of the wound spring section (24a) around to a second portion of the wound spring section (24b) and then into a second portion of the at least one extension (26b) at the second end of the elongate wire-like material, wherein the axis of the first and second sections of the wound spring section (24a, 24b) align and the loop like resilient means (23) provides a flat lower surface upon which to rest the spring (20).

6. The ski binding of any of the preceding claims, wherein the base plate is provided with a slot (15) forward of the ski boot receiving portion which is sized to allow the at least one extension (21) from the spring (20) to pass through and also to allow the at least one extension (21) to flex forward when a force is applied thereto.

7. The ski binding of any of the preceding claims, wherein a displaceable covet (27) is provided on the at least one extension (21) and can move along the length of the extension (21).

8. A ski binding (1) for a cross country or touring ski (2), in particular according to any one of the claims 1 to 7, comprising :

a base plate (10) for attachment to the upper surface (3) of the ski (2) wherein the base plate (10) is structured with a ski boot receiving portion (11) for both accommodating the rotation pin (4) of a ski boot (5) and allowing rotation of the ski boot (5); wherein the ski binding (1) further comprises a hook-like

- fastener (30) comprising two elongate arms (31) joined by a connecting bar (32) so as to form an "H" shape, wherein on one side of the connecting bar (32) the elongate arms (31) are provided with hooked portions (33), wherein the hook-like fastener (30) is held within the base plate (10) in a rotatable manner, and is positioned so that in one orientation the hooked portions (33) overlap at least a part of the ski boot receiving portion (11) so as to hold the rotation pin (4) of a ski boot (5).
9. The ski binding (1) of claim 8, wherein the base plate (10) is provided with a recess (14) on the underside (13) thereof, which is large enough to house the hook-like fastener (30) and which defines a cavity when the base plate (10) is attached to ski (2), such that when the hook-like fastener (30) is in the cavity it rests upon the upper surface (3) of the ski (2).
10. The ski binding (1) of claim 9, wherein the base plate (10) has at least one first slot (34) near the ski boot receiving portion (11), such that when the hook-like fastener (30) is within the cavity it is held in such a position that when it is rotated, the hooked portions (33) pass through the at least one slot (34) and can overlay at least a part of the ski boot receiving portion (11); and the base plate (10) has at least one second slot (35) positioned at the other side of the ski boot receiving portion (11) through which the portion of the elongate arms (31) not provided with the hooked portions (33) extend, and thus providing rotation arms (36).
11. The ski binding (1) of either claims 9 or 10, wherein the binding (1) further comprises a holding plate (40) which fits within the cavity, wherein the holding plate (40) comprises a lower flat resting surface (41) with at least one lower indent (42) therein, which is sized and shaped to accommodate the connecting bar (32) of the hook-like fastener, and at least one upper indent (43) directly above the lower indents (42).
12. The ski binding (1) of claim 11, wherein the at least one upper indent (43) of the holding plate (40) is positioned so that it coincides with and defines the ski boot receiving portion (11) by means of a third slot (37) in the base plate (10), and wherein the at least one lower indent (42) defines the rotation point of the hook-like fastener (30) such that the hook-like fastener (30) rotates around its connecting bar (32), and in one orientation the hooked portions (33) will align with the axis of the at least one upper indent (43) thus closing the ski boot receiving portion (11) and enabling the locking of a ski boot (5) to the ski binding (1).
13. The ski binding of any one of claims 8 to 12, wherein the hook-like fastener (30) is held between the base plate (10) and the upper surface (3) of the ski (2) or a mounting plate (16) attached to the upper surface (3) of the ski (2) in a bistable manner, so that it can be rotated between a stable closed position, in which the hooked portions (33) overlap at least a part of the ski boot receiving portion (11), and a stable open position, in which the hooked portions (33) do not overlap at least a part of the ski boot receiving portion (11).
14. The ski binding of any one of claims 8 to 13, wherein the elongate arms (31) of the hook-like fastener (30) are not straight and form a bend (38) centred around the connecting bar (32), so that when looking along the axis of the connecting bar (32) the hooked portions (32) and the rotation arms (36) make an angle of less than 180° with respect to each other; wherein the hooked portions (33) and the rotation arms (36) have lower surfaces, those which define the larger than 180° angle, which are approximately straight either side of where they meet at the connecting bar (32) thus forming a protrusion (39), and further the hook-like fastener (30) is held within the base plate (10) such that in one orientation the lower straight surface of the hooked portions (33) is resting on the upper surface of the ski (3) and in the other orientation the lower straight surface of the rotation arms (36) is resting on the upper surface of the ski (3), and wherein when rotating the hook-like fastener (30) around the connecting bar (32) between the two orientations, the protrusion (39) pushes against the top surface of the ski (3) and interferes with the rotation and provides a resistance to such, thus providing a mechanism of locking the hook-like fastener in one or other of the orientations.
15. A ski binding (1) for a cross country or touring ski (2), comprising :
- a base plate (10) for attachment to the upper surface (3) of the ski (2) wherein the base plate (10) is structured with a ski boot receiving portion (11) for both accommodating the rotation pin (4) of a ski boot (5) and allowing rotation of the ski boot (5); wherein the ski binding (1) further comprises a spring (20) which has at least one extension (21) providing a flexor portion (22), wherein the at least one extension (21) extends upward from the upper surface (12) of the base plate (10) at a position forward of the ski boot receiving portion (11), such that the front of a ski boot (5) attached to the base plate (10) would act upon the at least one extension (21) of the spring (20) on the occasion that the ski boot (5) were rotated around the ski boot receiving portion (11), thus putting

the spring (20) under tension; and
the ski binding (1) further comprises a hook-like
fastener (30) comprising two elongate arms (31)
joined by a connecting bar (32) so as to form an
"H" shape, wherein on one side of the connect- 5
ing bar (32) the elongate arms (31) are provided
with hooked portions (33), wherein
the hook-like fastener (30) is held within the base
plate (10) in a rotatable manner, and is posi- 10
tioned so that in one orientation the hooked por-
tions (33) overlap at least a part of the ski boot
receiving portion (11) so as to hold the rotation
pin (4) of a ski boot (5).

16. The ski binding (1) according to claim 15, wherein 15
the ski binding (1) comprises the further limitations
given in any one or more of claims 2 to 7 and 9 to 13.

17. The ski binding (1) according to any one of the pre- 20
ceding claims, wherein either or all of the spring (20),
the hook-like fastener (30) and the holding plate (40)
are held within the ski binding (1) by being sand-
wiched between the base plate (10) and the upper
surface of the ski (2) or a mounting plate (16) at- 25
tached to the upper surface (3) of the ski (2).

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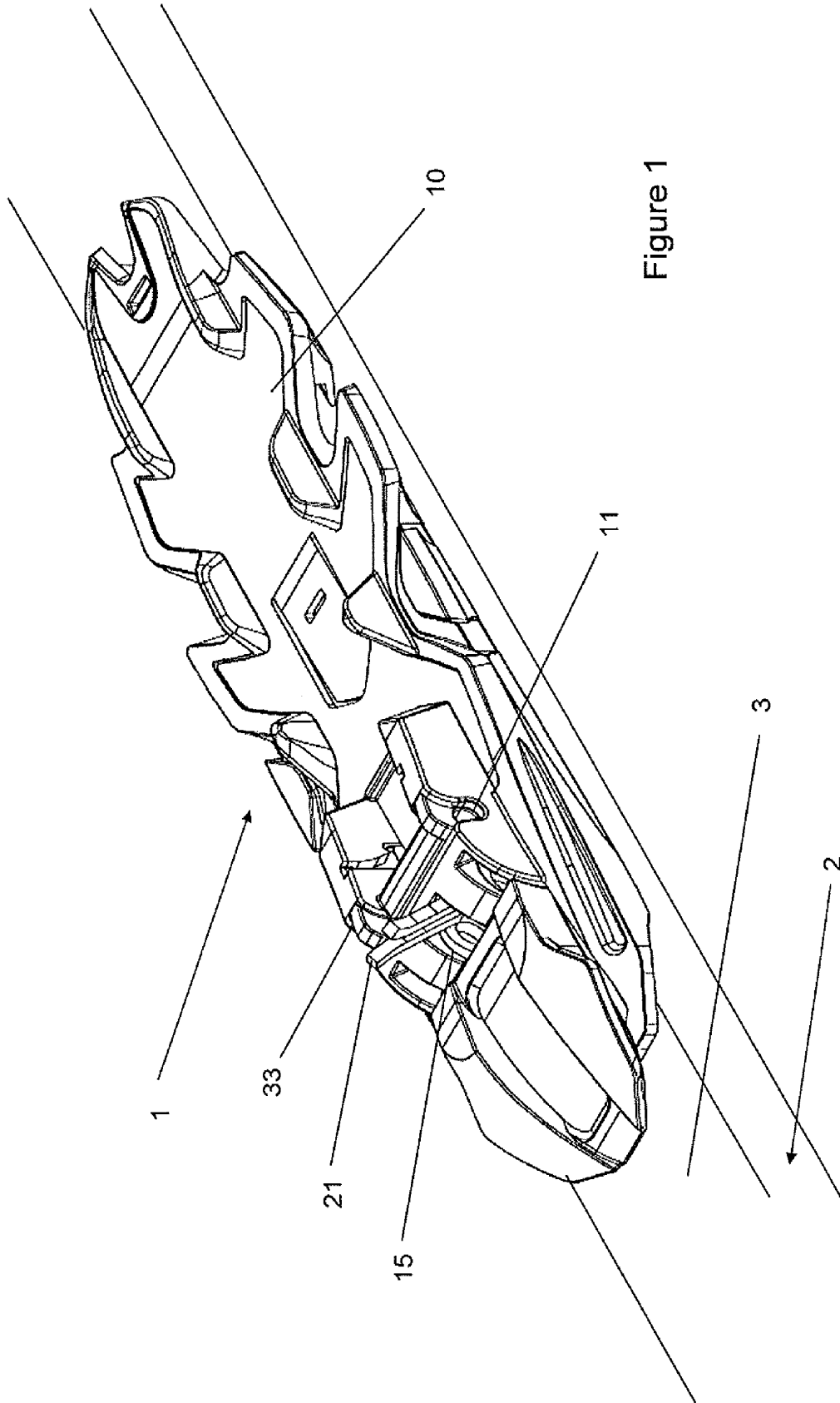


Figure 1

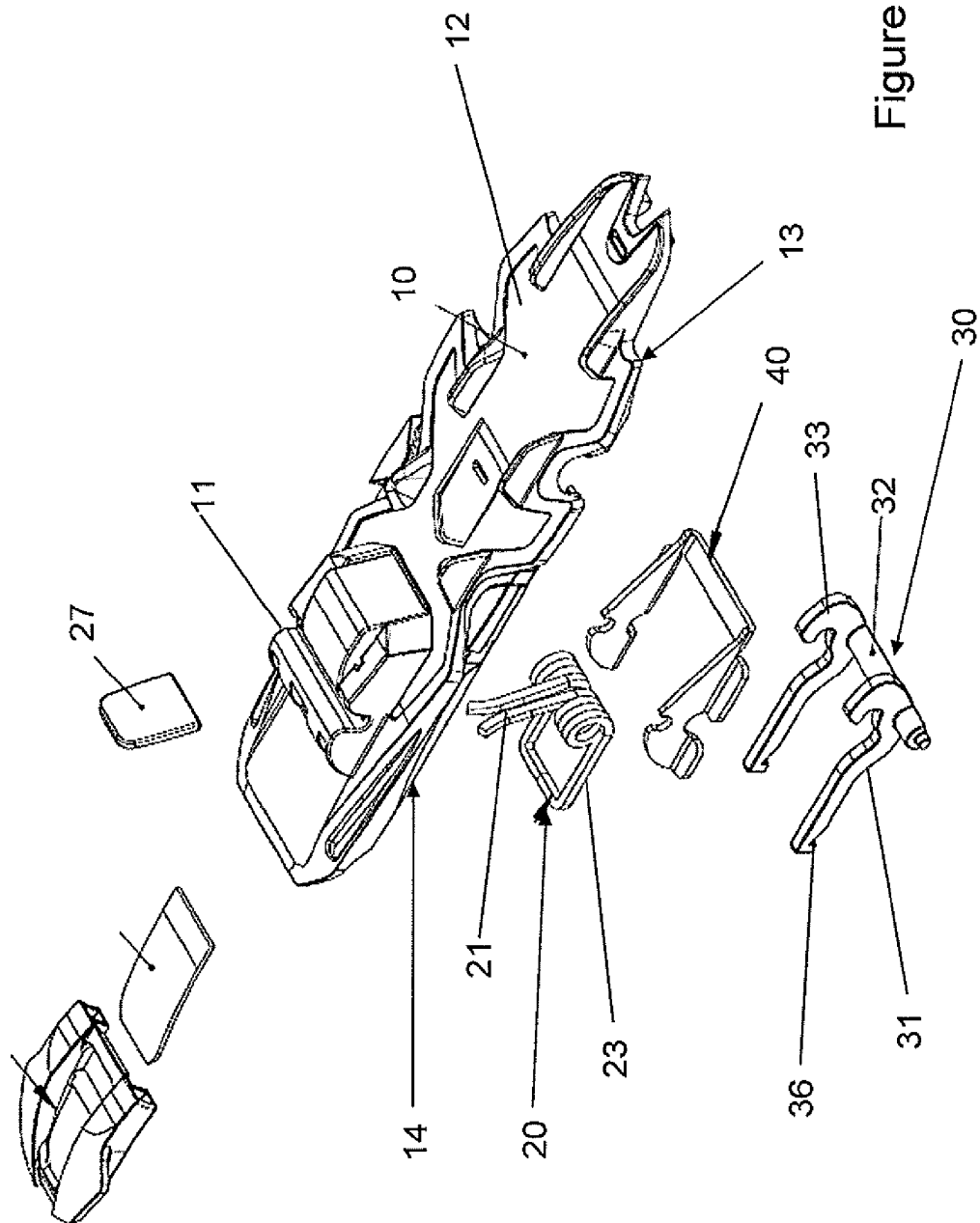


Figure 2

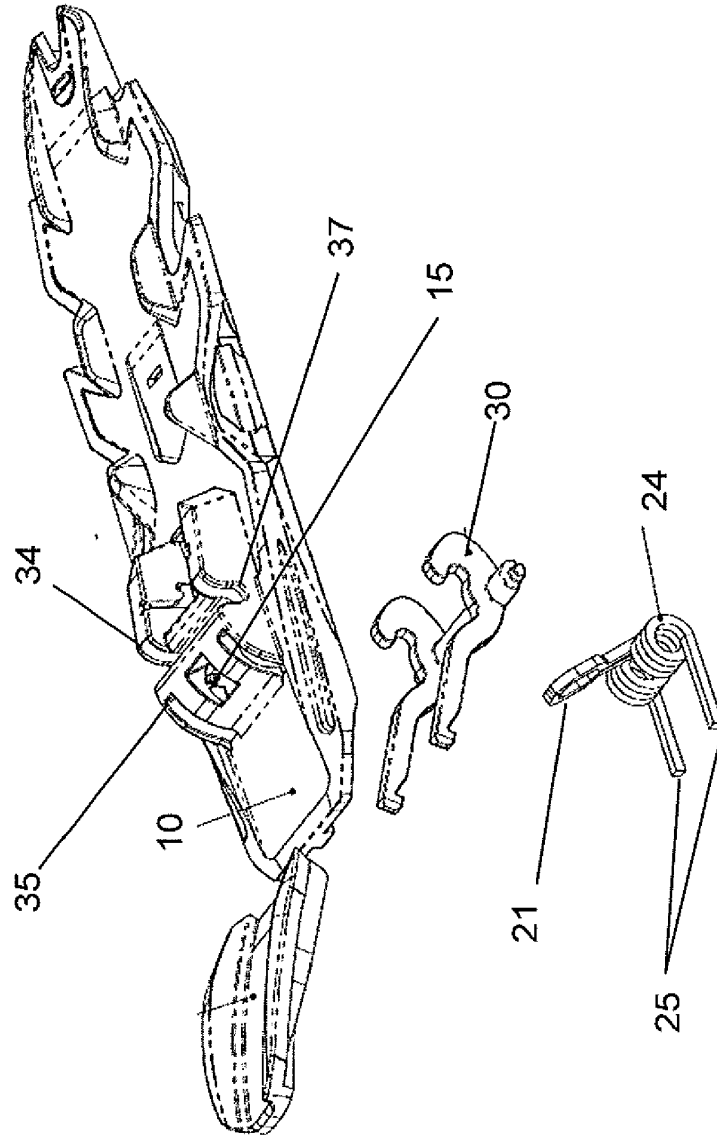


Figure 3

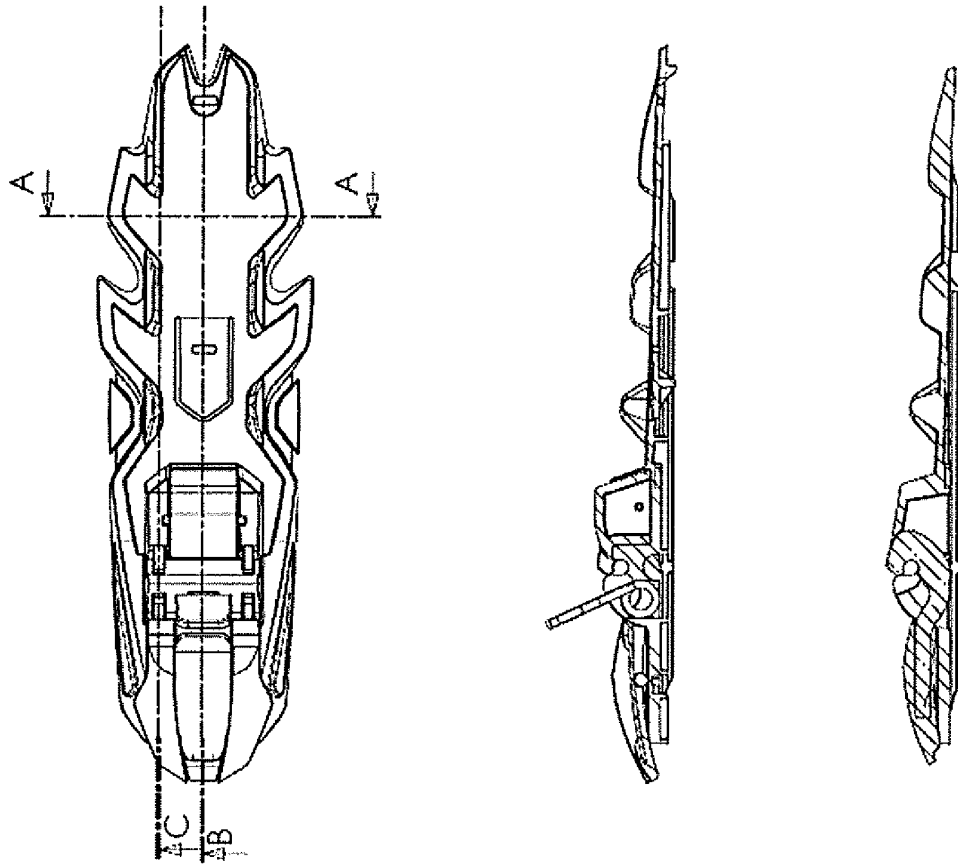


Figure 4

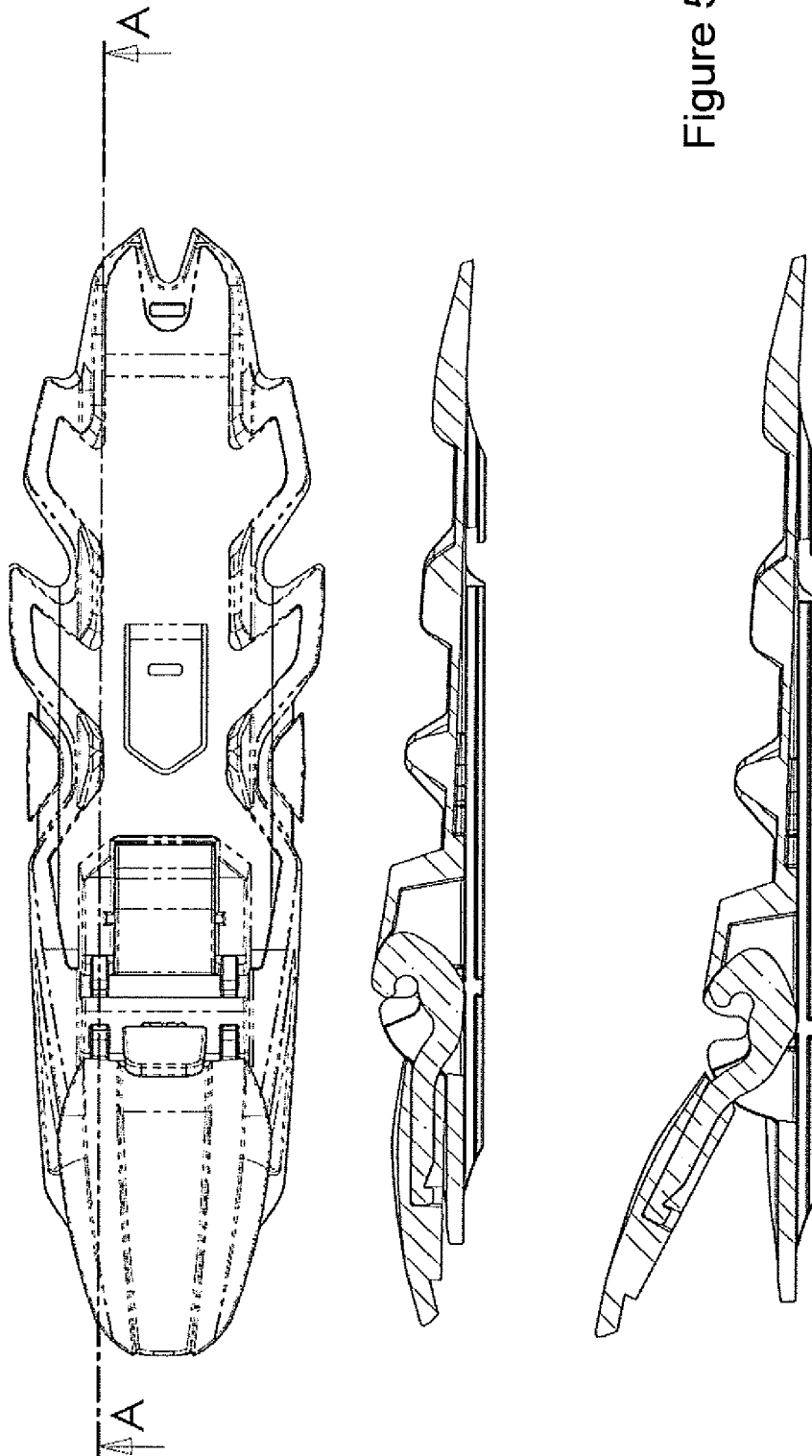


Figure 5

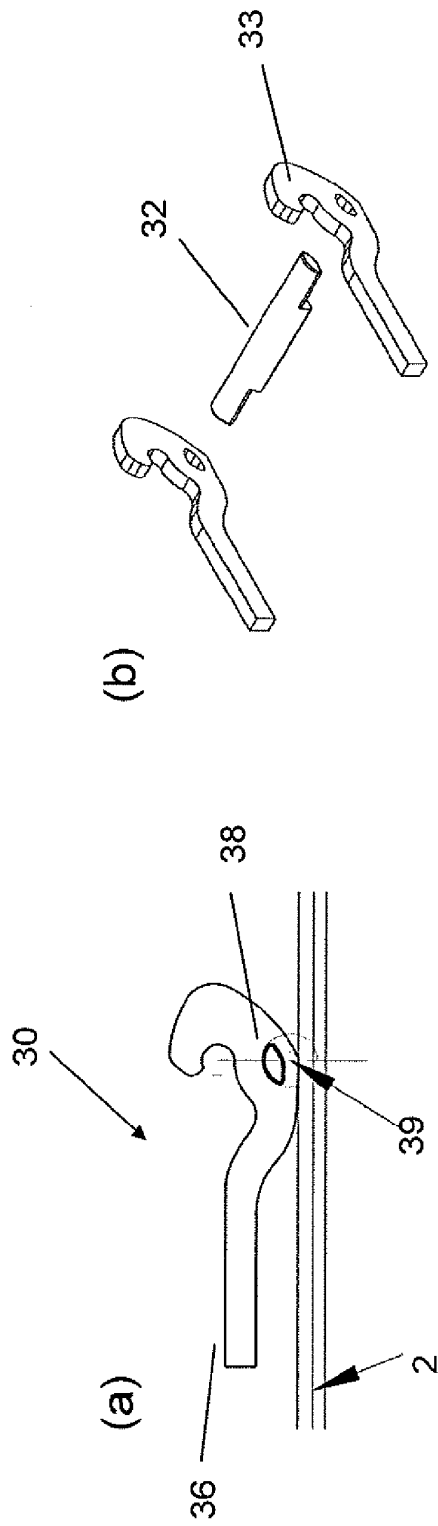


Figure 6

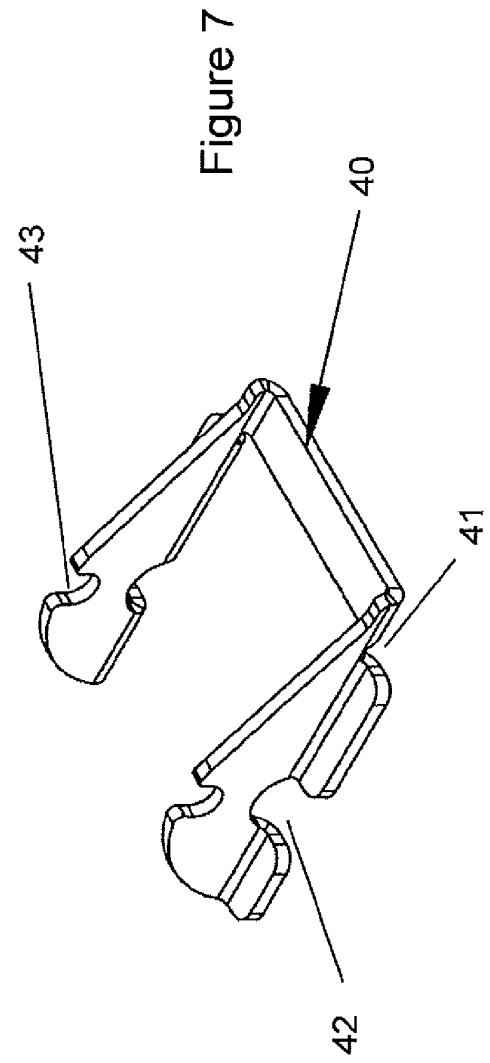


Figure 7



EUROPEAN SEARCH REPORT

 Application Number
 EP 08 16 8676

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* page 13, line 13 - page 13, line 23; figure 8 *	2-4	
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Y	* column 14, lines 20-40 - column 10, lines 9-43; figures 42-47,78-80 *	2-4	
Y	EP 1 795 236 A (ROTTEFELLA AS [NO]) 13 June 2007 (2007-06-13)	2-4	
A	DE 10 2006 041840 A1 (ROTTEFELLA AS [NO]) 14 February 2008 (2008-02-14)	7	
A	US 6 409 204 B1 (AYLIFFE HAROLD EDWARD [CA]) 25 June 2002 (2002-06-25)	4	TECHNICAL FIELDS SEARCHED (IPC)
	* column 7, line 60 - column 8, line 61; figures 5,6 *		A63C
A	EP 1 785 172 A1 (ROSSIGNOL SA [FR]) 16 May 2007 (2007-05-16)	8-14	
	* figures 1,2,3,4,6 * * paragraph [0023] - paragraph [0027]; figures 1,2,3,4,6 *		
<div style="border: 1px solid black; padding: 5px;"> <p>The present search report has been drawn up for all claims</p> </div>			
Place of search		Date of completion of the search	Examiner
Munich		30 June 2009	Murer, Michael
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			

 4
 EPO FORM 1503 03.82 (P04C01)



Application Number

EP 08 16 8676

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

1-14

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 08 16 8676

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7

A ski binding for a cross-country or touring ski, comprising a spring which has at least one extension providing flexor portion.

2. claims: 8-14

A ski binding for a cross-country or touring ski, comprising a hook-like fastener comprising two elongated arms joined by a connecting bar so as to form a "h" shape, wherein one side of the connecting bar the elongated arms are provided with hooked portions

3. claims: 15-17

A ski binding for a cross country or touring ski comprising a hook like fastener as in group 2 and a spring as in group 1

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 16 8676

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30-06-2009

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82