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(54) **A TOE-PIECE OF A SKI MOUNTAINEERING BINDING**

(57) The toe-piece (100) of a ski mountaineering binding comprises: a first jaw (1) and a second jaw rotatably coupled with a base (B) fixable to a ski (S); a first hooking element (10) borne by the first jaw (1) and having a first tip (11) for inserting in a first lateral hole (F1) of the front part (A) of a ski boot (D) for ski mountaineering and a second hooking element (20) borne by the second jaw (2) and having a second tip (21) for inserting in a second lateral hole (F2) of the front part (A) of the ski boot (D) for ski mountaineering when the toe-piece assumes a configuration (O1) of an inserted ski boot.

The toe-piece is configured in such a way that at least the first hooking element (10) is inserted in a first seat (12) present in the first jaw (1) with the first tip (11) exiting from the first seat (12) and in such a way as to be able to perform a roto-translatory motion between a retracted position (PR), when the ski boot (D) for ski mountaineering is aligned to the longitudinal axis of the ski (S), and an advanced position (PA) of a plurality of possible advanced positions in which it is more greatly projecting from the first seat (12) when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S).

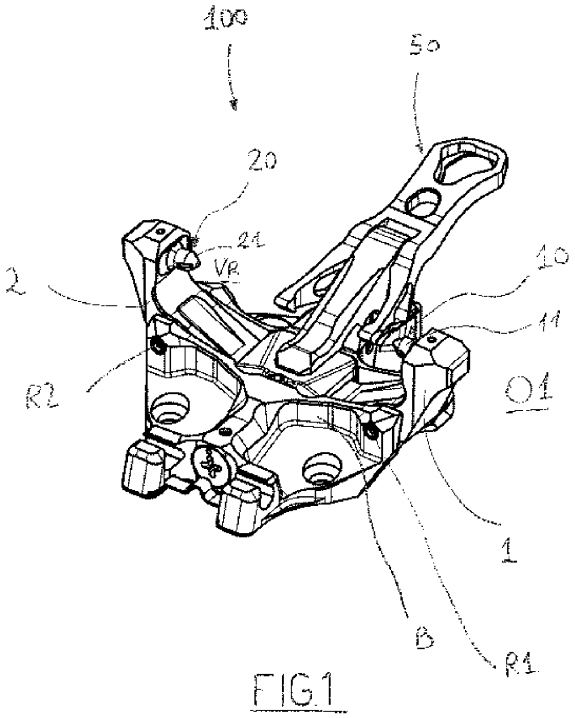

FIG1

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Description

[0001] The present invention relates to the technical sector concerning equipment used in ski mountaineering, being ski mountaineering bindings.

[0002] In particular, the present invention concerns a toe-piece of a ski mountaineering binding.

[0003] As is known, a toe-piece of a ski mountaineering binding comprises:

a base which is fixable to a ski;

a first jaw, which is rotatably coupled to the base with respect to a first rotation axis parallel to the longitudinal axis of the ski;

a second jaw, which is rotatably coupled to the base with respect to a second rotation axis parallel to the first rotation axis and to the longitudinal axis of the ski.

[0004] The toe-piece further comprises:

a first hooking element comprising a first tip conformed to insert by form coupling in a first lateral hole present in the front part of a ski boot, with the first hooking element being rigidly mounted and fixed in a first seat present in the first jaw, so that the first tip remains projecting from the first jaw and facing towards the second jaw;

a second hooking element comprising a second tip conformed to insert by form coupling in a second lateral hole present in the front part of a ski boot, and on an opposite side with respect to the first lateral hole, with the second hooking element being rigidly mounted and fixed in a second seat present in the second jaw, so that the second tip remains projecting from the second jaw and facing towards the first jaw.

[0005] Elastic means are present in the toe-piece, activatable via a lever, in order to activate the first jaw and the second jaw in rotation with respect to the base about the respective first and second rotation axis.

[0006] The toe-piece is thus configured and realised in such a way as to be able to assume:

a configuration ready to receive the front part of the ski boot, in which the first jaw and the second jaw are in a moved-away position with the first tip of the first hooking element and the second tip of the second hooking element being moved away from one another by a distance such as to enable the insertion and positioning between them of the front part of the ski boot;

and an inserted ski boot configuration, in which the first jaw and the second jaw are in a neared position, in such a way that the first tip of the first hooking element is inserted by form coupling in the first lateral hole of the front part of the ski boot, and the second tip of the second hooking element is inserted by form coupling in the second lateral hole of the front part of the ski boot, with the ski boot being aligned to the longitudinal axis of the ski and thus ready for skiing downhill.

[0007] Therefore, in the inserted ski boot configuration, the first tip of the first hooking element and the second tip of the second hooking element are inserted, respectively, in the first lateral hole and the second lateral hole present bilaterally in the front part of the ski boot and are aligned to the two holes according to an alignment axis of the holes that is perpendicular to the longitudinal axis of the ski.

[0008] The first tip has a respective external coupling surface which is conformed in a complementary way to the first hole, for functionally coupling with the inner surface of the first hole, when the first tip is inserted in the first hole, and the second tip also has a respective external coupling surface which is conformed in a complementary way to the second hole, for functionally coupling with the inner surface of the second hole, when the second tip is inserted in the second hole.

[0009] The above-described type of toe-piece of a ski mountaineering binding has, however, some drawbacks.

[0010] During the descent, with the skis attached to the feet, in a case where the skier is subject to transversal stresses to the ski, which generate momentum or torque on the ski boot, the ski boot will tend to rotate, misaligning with respect to the longitudinal axis of the ski.

[0011] The front part of the ski boot, therefore, will be subject to a rotation (clockwise or anti-clockwise) with respect to the longitudinal axis of the ski, according to the direction of the transversal solicitation or of the direction of the torque which acts on the ski boot.

[0012] The onset of a rotation of the front part of the ski boot with respect to the longitudinal axis of the ski determines a misalignment between the alignment axis of the holes present in the front part and the tips of the hooking elements.

[0013] Further, owing to the rotation of the front part of the ski boot, with respect to the longitudinal axis of the ski, one of the two holes present in the front part of the ski boot will tend to near the longitudinal axis of the ski, thus moving away from the respective tip of the hooking element inserted therein.

[0014] This leads to the detachment, and the decoupling, between the coupling surface of the tip of the hooking element with the inner surface of the hole, with a consequent unhooking of the ski boot from the toe-piece of a ski binding for ski mountaineering.

[0015] With the toe-pieces of the ski mountaineering binding of the prior art, such as those described in the foregoing, even rotations of a small entity cause the unhooking of the ski boot from the toe-piece.

[0016] This occurrence constitutes a drawback, as the skier will have the ski unhooked including in all those cases where the stresses received on the ski boot are of such an entity (in terms of duration and/or intensity) as in any case to enable continuation of skiing downhill with no problem or consequence.

[0017] The aim of the present invention is therefore to describe a new toe-piece of a ski mountaineering binding, for hooking the front part of a ski boot for ski mountaineering, able to obviate the drawbacks set out in the foregoing.

[0018] In particular, an aim of the present invention is to describe a new toe-piece of a ski binding for ski mountaineering which enables maintaining a contact with the front part of the ski boot even in a consequence of the onset of rotations of the front part of the ski boot with respect to the longitudinal axis of the ski which are not of an entity such as to require, for reasons of safety, the unhooking of the ski boot, thus allowing the skier to be able to continue the descent with the skis hooked to the ski boots, and further allowing a realignment of the ski boot to the ski once the effect of the solicitation has ended.

[0019] The above-mentioned aims are obtained with a toe-piece for a ski mountaineering binding according to the contents of the claims.

[0020] Preferred embodiments of the toe-piece of a ski binding for ski mountaineering realised in accordance with the present invention will be described in the following with reference to the accompanying tables of drawings, in which:

- figure 1 schematically illustrates in a perspective view, the toe-piece of a ski binding for ski mountaineering of the invention, in a possible configuration that it can assume, corresponding to the inserted ski boot configuration, in this figure the ski boot has not been illustrated;
- figure 2 is a plan view from above of figure 1;
- figure 3 is a frontal view of the toe-piece of figure 1;
- figure 4 is a partial view along section plane I-I of figure 3;
- figure 5 is a partial view along section plane II-II of figure 3;
- figure 6 illustrates detail K of figure 4 in larger scale;
- figure 6A is the view along section plane III-III of figure 2;
- figure 6B is the view along section plane IV-IV of figure 2;
- figure 6C illustrates detail H of figure 6B in larger scale;
- figure 7 illustrates, in a schematic perspective view, a possible configuration that the toe-piece of a ski mountaineering binding can assume consequently to a rotation of the front part of the ski boot for ski mountaineering in a first rotation direction (for example anticlockwise) with respect to the longitudinal axis of the ski for maintaining the contact with the front part of the ski boot for ski mountaineering, in this figure, for reasons of clarity, both the ski boot for ski mountaineering and the ski have not been illustrated;
- figure 8 is a plan view from above of figure 7;
- figure 9 illustrates, in a schematic perspective view, a possible further configuration that the toe-piece of the ski mountaineering binding can assume consequently to a rotation of the front part of the ski boot for ski mountaineering in a second rotation direction (for example clockwise) with respect to the longitudinal axis of the ski, in this figure, for reasons of clarity, both the ski boot for ski mountaineering and the ski have not been illustrated;
- figure 10 is a plan view from above of figure 9;
- figure 11 is a partially sectioned view of detail L of figure 8,
- figure 12 is a partially sectioned view of detail M of figure 8,
- figure 13 is a view of detail (N) of figure 12 in larger scale;
- figure 13A illustrates, according to a frontal view, a possible further embodiment of the toe-piece of the invention;
- figure 13B is the view along section plane V-V of figure 13A;
- figure 13C illustrates the detail denoted by F in figure 13B in larger scale;
- figure 14 illustrates, in a view from above, a portion of a ski and a ski boot for ski mountaineering hooked to the toe-piece of the invention positioned in the inserted ski boot configuration of figure 1, in which the ski boot for ski mountaineering is aligned to the longitudinal axis of the ski;
- figure 15 is a larger-scale illustration of a part of figure 14;
- figures 16 is the view according to figure 14 with the ski boot for ski mountaineering having been subject-

ed to a solicitation that causes it to rotate with respect to the longitudinal axis of the ski in a first anticlockwise rotation direction and in which the toe-piece of the invention has assumed the configuration illustrated in figures 7 and 8 for maintaining the contact with the front part of the ski boot for ski mountaineering;

- figure 17 is a larger-scale illustration of a part of figure 16;

- figure 18 is the view according to figure 14 with the ski boot for ski mountaineering having been subjected to a solicitation that causes it to rotate with respect to the longitudinal axis of the ski in a second clockwise rotation direction and in which the toe-piece of the invention has assumed a configuration illustrated in figures 9 and 10 for maintaining the contact with the front part of the ski boot for ski mountaineering;

- figure 19 is a larger-scale illustration of a part of figure 18.

[0021] With reference to the accompanying tables of drawings, reference numeral (100) denotes the toe-piece of the ski mountaineering binding of the present invention.

[0022] The toe-piece (100) comprises:

a base which is fixable to a ski (S);

a first jaw (1) and a second jaw (2),

a first hooking element (10) of the front part (A) of a ski boot (D) for ski mountaineering and a second hooking element (20) of the front part (A) of a ski boot (D) for ski mountaineering.

[0023] The first jaw (1) is rotatably coupled to the base (B) with respect to a respective first rotation axis (R1) which is parallel to the longitudinal axis of the ski (S), when the toe-piece (100) is fixed to the ski (S), while the second jaw (2), in turn, is rotatably coupled to the base (B) about a respective second rotation axis (R2) which is parallel to the first rotation axis (R1) and thus also parallel to the longitudinal axis of the ski (S).

[0024] The first hooking element (10) is borne superiorly by the first jaw (1), and facing towards the second jaw (2), and comprises a first tip (11) of a suitable shape for inserting in a first lateral hole (F1) which is made in the front part (A) of a ski boot for ski mountaineering.

[0025] In this regard, the first jaw (1) comprises a first seat (12) for partially receiving the first hooking element (10), so that the first tip (11) exits from the first seat (12).

[0026] The second hooking element (20) is borne superiorly by the second jaw (2), and faces towards the first jaw (1), and comprises, at a relative end, a second tip (21) having a suitable shape for inserting in a second lateral hole (F2) which is made in the front part (A) of the ski boot (D) for ski mountaineering and which is opposite the first lateral hole (F1).

[0027] The toe-piece (100) also comprises an activating lever (50) and first elastic means (E) (see for example figure 6A) which act at least on the first jaw (1) and/or on the second jaw (2).

[0028] With the activation of the activating lever (50) and the action exerted by the first elastic means (E), the toe-piece (100) can assume a configuration ready to receive the front part (A) of the ski boot (D) for ski mountaineering and a configuration (01) of inserted ski boot, in which the ski boot is hooked by the toe-piece so as to enable the skier to ski downhill.

[0029] In the configuration ready to receive the front part (A) of the ski boot (D) for ski mountaineering (not illustrated in the appended figures as widely known) the first jaw (1) and the second jaw (2) are positioned with respect to one another in a moved-away configuration and distanced from one another by a distance that enables positioning the front part (A) of the ski boot (D) for ski mountaineering between the two jaws.

[0030] In the configuration (O1) of the inserted ski boot (illustrated for example in figures 1, 2, 3), the two jaws are neared to one another in such a way the first tip (11) of the first hooking element (10) is inserted in the first lateral hole (F1) of the front part (A) of the ski boot (D) for ski mountaineering and the second tip (21) of the second hooking element (20) is inserted in the second lateral hole (F2) of the front part (A) of the ski boot for ski mountaineering, hooking the toe-piece of the ski boot (see for example figures 14 and 15).

[0031] In this configuration (O1) of the inserted ski boot, the first elastic means (E) act at least on the first jaw (1) and/or on the second jaw (1) so as to stably maintain the ski boot for ski mountaineering aligned to the longitudinal axis of the ski (S) and enable the skier to ski downhill. Figures 14 and 15 illustrate the toe-piece (100) in the configuration (O1) of the inserted ski boot with the ski boot (D) for ski mountaineering (S) aligned to the longitudinal axis of the ski (S).

[0032] The toe-piece (100) is also configured, in known ways, in such a way that, in a case of the skier experiencing a fall, or for any other reason of safety, it can unhook from the front part of the ski boot for ski mountaineering following a splaying of the two jaws which newly brings it to a distance greater than the width of the front part of the ski boot.

[0033] The special characteristics of the toe-piece (100) of a ski mountaineering binding, object of the present invention consist in the fact that at least the first hooking element (10) is inserted and engaged in the first seat (12) present in the first jaw (1) in such a way as to be able to perform, with respect to the first seat (12), a roto-translatory motion between a retracted position (PR) (see for example figures 1, 2, 3, 4 and 6) and an advanced position (PA) (see for example figures 7, 8, 9, 10) of a plurality of possible advanced positions at each of which

it is more greatly and progressively projecting from the first seat (12), i.e. more greatly projecting from the first jaw (1).

[0034] Further, the toe-piece (100) of a ski mountaineering binding is designed in such a way that, in the configuration (O1) of an inserted ski boot, the first hooking element (10) assumes: the retracted position (PR) when the ski boot for ski mountaineering is aligned to the longitudinal axis of the ski (S) (see for example figures 1, 2, 3, 4, 6 and figures 14 and 15); and an advanced position (PA) of the plurality of possible advanced positions when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S), for example since it is forced to perform an anti-clockwise rotation (see for example figures 16 and 17) or a clockwise rotation (figures 18 19) with respect to the longitudinal axis of the ski, following an external solicitation.

[0035] In this way, given the possibility that at least the first hooking element (10) can perform a roto-translatory movement with respect to the first seat (12) that accommodates it, and shift into an advanced position (PA) with respect to the first seat (12) in which it is more greatly projecting from the first jaw (1), should, during a descent, a temporary misalignment occur of the front part of the ski boot with respect to the longitudinal axis of the ski, for example due to a transversal solicitation on the ski boot of an entity that is such as not to trigger the splaying of the two jaws for the unhooking of ski boot for reasons of safety, the first tip (11) of the first hooking element (10) can remain at least partially in contact with the first lateral hole (F1) of the ski boot, thus preventing an undesired detachment from the ski boot, thus allowing the skier to be able to continue the descent with the skis hooked to the ski boot.

[0036] The toe-piece is designed and realised in such a way that the first hooking element can move into an advanced position with respect to the first seat, and thus project more greatly from the first jaw, to an entity of displacement that does not preclude the possible unhooking of the toe-piece from the ski boot in a case of risks for the safety of the skier, such as for example as a consequence of a fall.

[0037] Further advantageous aspects of the toe-piece of the invention are described in the following.

[0038] The first seat (12) is conformed in such a way as to comprise an external housing (121) (for example having a truncoconical shape) and an internal housing (122) (for example having a cylindrical shape) (see for example figures 4, 6, 6B, 6C) in communication with one another, with the first hooking element (10) being conformed in such a way as to comprise a first part (111), which is profiled in a complementary way to the external housing (121) of the first seat (12) and which bears the first tip (11), and a second part (122), connected to the first part (111), which is conformed in such a way as to be freely accommodated, with freedom to perform roto-translational movement, in the internal housing (122) of the first seat (12).

[0039] In particular, with the toe-piece (100) in the configuration (O1) of the inserted ski boot with the ski boot (D) for ski mountaineering axis aligned to the longitudinal axis of the ski (S), the first hooking element (10) is in the retracted position (PR) with the first part (111) inserted and in contact with the external housing (121) of the first seat (12) and with the second part (112) completely inserted in the internal housing (122) (see figures 6 and 6C).

[0040] In this configuration, with the first hooking element (10) in the retracted position (PR), the first part (111) of the first hooking element (10) is in abutment against the surface of the external housing (121) of the first seat (12) (as illustrated in figures 4, 6, 13B and 13C).

[0041] When, instead, the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S), for example due to a transversal solicitation to which the ski boot is subjected during a descent, the first hooking element (10) assumes at least an advanced position (PA) of the plurality of possible advanced positions with the first part (111) uncoupling, at least partially exiting, from the external housing (121) of the first seat (12) and with the second part (112) performing a roto-translatory movement inserted with respect to the internal housing (122) enabling the first tip (11) to remain at least partially in contact with the first hole (F1) of the front part (A) of the ski boot (D) for ski mountaineering.

[0042] In a particularly advantageous aspect, the toe-piece (100) can comprise retaining means (3) which are configured to allow the first hooking element (10) to perform a roto-translatory movement from the retracted position (PR) to an extreme advanced end-run position (PAF) (see for example figures 12 and 13) of the plurality of possible advanced positions at which the first hooking element (10) is retained in a configuration of maximum protrusion with respect to the first seat (12), i.e. of maximum projection from the first jaw (1).

[0043] This is particularly advantageous in a case in which contact is lost between the first tip and the first lateral hole present in the front part of the ski boot, for example due to a splaying of the two jaws for the unhooking of the toe-piece for reasons of safety, as the first hooking element is retained with at least the respective second part still partially accommodated in the internal housing, in such a way as to prevent a complete exit and decoupling from the first jaw.

[0044] The retaining means can be realised in various embodiments, some of which have been illustrated in detail in the drawings.

[0045] For example, in a possible preferred embodiment, the retaining means (3) can be made in such a way as to comprise at least a pin (31, 40), which is arranged in such a way as to transversally involve the internal housing (122) of the first seat (12) (for example in a vertical direction or a horizontal direction), and a slot (32) (see figures 4, 6, 6C, 12, 13) or a recess (42) (see figures 13B and 13C), made and arranged along the second part

(112) of the first hooking element (10) and delimited by an external wall (321, 421) and an internal wall (322, 422), with the pin (31, 40) being inserted in the slot (32) or recess (42).

[0046] In this way, when the second part (112) of the first hooking element (10) is totally housed in the internal housing (122) of the first seat (12), the first part (111) of the first hooking element (10) is in abutment against the surface of the external housing (121) of the first seat (12) for the definition of the retracted position (PR) for the first hooking element (10) (figures 6, 13C), the pin (31, 40) will be located in a position in proximity of (or possible also adjacent to) the external wall (321,421) of the slot (32) or of the recess (42), while when the roto-translatory movement of the first hooking element (10) brings the internal wall (322, 422) of the slot (32) or the recess (42) into abutment against the pin (31, 40), then the first hooking element (10) will have reached to the extreme advanced end-run position (PAF) (figure 13) and will be at least partially in the first seat (12) preventing the complete exit and fall with respect to the first jaw (1).

[0047] Alternatively, according to a further possible embodiment, not illustrated in detail, the retaining means (3) can be realised in such a way as to comprise only at least one spring, arranged in such a way as to be in contact with the second part (112) of the first hooking element (10) and which is configured: to allow the first hooking element (10) to assume the retracted position (PR), in the configuration (O1) of the inserted ski boot with the ski boot for ski mountaineering aligned to the longitudinal axis of the ski (S); to allow the first hooking element (10) to assume the advanced position (PA), to an extreme advanced end-run position (PAF) of the plurality of possible advanced positions, when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S), and to recall the first hooking element (10) towards the retracted position (PR) when the ski boot (D) for ski mountaineering returns into alignment with the longitudinal axis of the ski (S).

[0048] In the preferred embodiment illustrated in figures 4, 6, 6C, 12, 13, wherein, as previously described, the retaining means (3) comprise a pin (31) inserted in a slot (32), can be realised in such a way as also to comprise a spring (4) which is inserted in a niche (41) made in the second part (112) of the first hooking element (10) in such a way the spring (4) is in abutment, on a first side, against a wall of the niche (41), and on the other side is in contact with the pin (31) in such a way that the spring (4) is compressed when the first hooking element (10) assumes any advanced position (PA), to an extreme advanced end-run position (PAF), of the plurality of possible advanced positions consequently to a misalignment of the ski boot (D) for ski mountaineering with respect to the longitudinal axis of the ski (S), in order to recall the first hooking element (10) towards the retracted position (PR) when the ski boot (D) for ski mountaineering returns into alignment with the longitudinal axis of the ski (S).

[0049] In a preferred but not exclusive embodiment, illustrated in figures 13A, 13B and 13C, the retaining means (3), as well as the pin (40) inserted in the recess (42) can be made in such a way as also to comprise at least a magnet (70), for example a permanent magnet configured in such a way as to be able to exert an action of attraction on the second part (112) of the first hooking element (10), which is made of a metal material.

[0050] The at least a magnet (70) can be arranged in a suitable cavity (71) made in a wall (73) of the internal housing (122) of the first seat (12) present in the head of the first jaw (1) (figure 13C).

[0051] The at least a magnet (70) thus exerts an action of attraction on the first hooking element (10), retaining it in the retracted position (PR) (figures 13B and 13C), with the first part (111) of the first hooking element (10) in abutment against the surface of the external housing (121) of the first seat (12), and with the pin (40) in proximity of, or adjacent to, the external wall (421) of the recess (42), and is destined to attract the first hooking element (10) to return into the retracted position each time the first hooking element (10) is brought into an advanced position of the plurality of possible advanced positions consequently to a temporary misalignment of the front part of the ski boot with respect to the longitudinal axis of the ski.

[0052] Advantageously, in order to have a steady and balanced behaviour, and there to maintain the contact of the first tip and the second tip, respectively with the first hole and with the second hole present on both sides of the front part of the ski boot, both when the ski boot misaligns from the longitudinal axis of the ski following an anti-clockwise rotation (figures 16 17), as previously described, and when the ski boot misaligns from the longitudinal axis of the ski following an anti-clockwise rotation (figures 18 19), the toe-piece (100) is realised and designed in such a way the second jaw (2) comprise a second seat (22) for partially receiving the second hooking element (20), so that the second tip (21) exits from the second seat (22), with the second hooking element (20) engaging in the second seat (22) in such a way as: to be able to perform a roto-translatory motion between a retracted position (VR) and an advanced position (VA) of a plurality of possible advanced positions in which it is more projecting from the second seat (22).

[0053] Further, the toe-piece (100) of a ski mountaineering binding is designed in such a way that, in the configuration (O1) of an inserted ski boot the second hooking element (20) assumes: the retracted position (PR) when the ski boot for ski mountaineering is aligned to the longitudinal axis of the ski (S); and an advanced position (VA) of the plurality of possible advanced positions when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S).

[0054] In this way, both the first tip (11) and the second tip (21) can remain in contact, respectively with the first hole (F1) and with the second hole (F2), when the front part (A) of the ski boot (D) for ski mountaineering temporarily misaligns from the longitudinal axis of the ski (S)

either by performing an anti-clockwise rotation (figures 17, 18) or a clockwise rotation (figures 19, 20), enabling the toe-piece (100) to remain hooked to the front part of the ski boot for ski mountaineering and thus enabling the skier to proceed with the descent.

[0055] More in particular the second seat (22) is conformed in such a way as to comprise a second external housing (221) (for example having a truncoconical shape) and a second internal housing (222) (for example having a cylindrical shape), in communication with one another, with the second hooking element (20) being conformed in such a way as to comprise a first part (211), which is conformed in a complementary way to the second external housing (221) of the second seat (22) and which bears the second tip (21), and a second part (212), connected to the first part (211), which is conformed in such a way as to be freely accommodated, with freedom to perform roto-translational movement, within the second internal housing (222) of the second seat (22).

[0056] In the configuration (O1) of inserted ski boot and with the ski boot for ski mountaineering aligned to the longitudinal axis of the ski (S), the second hooking element (20) is in the retracted position (VR) with the first part (211) inserted and in contact with the second external housing (221) of the second seat (22) and with the second part (212) completely inserted in the second internal housing (222) (figure 5).

[0057] In this configuration, with the second hooking element (20) in the retracted position (VR), the first part (211) of the second hooking element (20) is in abutment against the surface of the second external housing (221) of the second seat (22) (as illustrated in figure 5).

[0058] Instead, when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S), the second hooking element (20) assumes at least an advanced position (VA) of the plurality of possible advanced positions (figures 7, 8, 9, 10) with the first part (211) uncoupling, at least partially, from the second external housing (221) of the second seat (22) and with the second part (212) performing a roto-translatory movement with respect to the second internal housing (222), enabling the second tip (21) to remain at least partially in contact with the second hole (F2) of the front part (A) of the ski boot for ski mountaineering (figures from 16 to 19).

[0059] The toe-piece (100) also comprises second retaining means (5) which are configured to enable the second hooking element (20) to perform a roto-translatory movement from the retracted position (VR) to an extreme advanced end-run position (VAF) of the plurality of possible advanced positions in which the second hooking element (20) is retained in a configuration of maximum protrusion with respect to the second seat (22) (figure 11).

[0060] In this case too, the second retaining means (5) can be realised in various ways, as previously described for the retaining means (3) of the first hooking element (10).

[0061] For example, the second retaining means (5) can be made in such a way as to comprise at least a second pin (51) arranged in such a way as to transversally involve the second internal housing (222) of the second seat (22) and a second slot (52) or a second recess realised and arranged along the second part (212) of the second hooking element (20) and delimited by an external wall (521) and an internal wall (522), with the second pin (51) being inserted in the second slot (52) or second recess.

[0062] In this way, when the second part (212) of the second hooking element (20) is accommodated totally within the second housing (222) of the second seat (22), and the first part (211) of the second hooking element (20) is in abutment against the surface of the second external housing (221) of the second seat (22) for the definition of the retracted position (PR) of the second hooking element (20) (figure 5), the second pin (51) is located in a position in proximity of, or adjacent to, the external wall (521) of the second slot (52), while when the roto-translatory movement of the second hooking element (20) brings the internal wall (522) of the second slot (52) into abutment against the second pin (51), then the second hooking element (20) will have reached the extreme advanced end-run position (VAF) (figure 11) and will be at least partially retained in the second seat (22) preventing the complete exit and fall with respect to the second jaw (2).

[0063] Alternatively, according to a further possible embodiment, not illustrated in detail, the second retaining means (5) can be made in such a way as to comprise only a second spring, arranged in such a way as to be in contact with the second part (212) of the second hooking element (20) and which is configured: to allow the second hooking element (20) to assume the respective retracted position (VR), in the configuration (O1) of the inserted ski boot with the ski boot (D) for ski mountaineering (S) aligned to the longitudinal axis of the ski (S); to allow the second hooking element (20) to assume the respective advanced position (VA), to an extreme advanced end-run position (VAF), when the ski boot (D) for ski mountaineering temporarily misaligns from the longitudinal axis of the ski (S); and to recall the second hooking element (20) towards the respective retracted position (VR) when the ski boot (D) for ski mountaineering returns into alignment with the longitudinal axis of the ski (S).

[0064] Further, when the second retaining means (5), as previously described, comprise a pin (51) inserted in a slot (52), the second retaining means (5) can also comprise a second spring (6) which is inserted in a second niche (61) made in the second part (212) of the second hooking element (20) in such a way that the second spring (6) is in abutment, on a first side, against a wall of the niche (61), and on the other side is in contact with the second pin (51) so that the spring (6) is compressed when the second hooking element (20) assumes a respective any advanced position (VA), to an extreme advanced end run position (VAF), of the plurality of possible advanced positions consequently to a misalignment of

the ski boot (D) for ski mountaineering with respect to the longitudinal axis of the ski (S), so as to recall the second hooking element (20) towards the respective retracted position (VR) when the ski boot (D) for ski mountaineering returns into alignment with the longitudinal axis of the ski (S).

[0065] Further, when the second retaining means comprise a second pin inserted in a second recess, they can be made in such a way as also to comprise at least a second magnet, for example a permanent magnet configured in such a way as to be able to exert an action of attraction on the second part of the second hooking element, which is made of a metal material.

[0066] The at least a second magnet can be arranged in a suitable second cavity made in a wall of the second internal housing of the second seat present in the head of the second jaw.

Claims

1. A toe-piece (100) of a ski mountaineering binding, wherein:

it comprises a base (B) which is fixable to a ski (S);
it comprises a first jaw (1) which is rotatably coupled to the base (B);
it comprises a second jaw (2) which is rotatably coupled to the base (B) and which is opposite the first jaw (1);
it comprises a first hooking element (10) which is borne by the first jaw (1) which in turn comprises, at a relative end, a first tip (11) for inserting in a first lateral hole (F1) made in the front part (A) of a ski boot (D) for ski mountaineering;
the first jaw (1) comprises a first seat (12) for partially receiving the first hooking element (10), so that the first tip (11) exits from the first seat (12);
it comprises a second hooking element (20) which is borne by the second jaw (2) which in turn comprises, at a relative end, a second tip (21) for inserting in a second lateral hole (F2) which is made in the front part (A) of the ski boot for ski mountaineering and which is opposite the first lateral hole (F1);
it is designed to assume a configuration (O1) of an inserted ski boot, for skiing downhill, in which the first tip (11) is inserted in the first lateral hole (F1) of the front part (A) of the ski boot (D) for ski mountaineering, in which the second tip (21) is inserted in the second lateral hole (F2) of the front part (A) of the ski boot (D) for ski mountaineering and in which the ski boot (D) for ski mountaineering is aligned to the longitudinal axis of the ski (S);
it comprises first elastic means (E) which act at least on the first jaw (1) and/or on the second jaw (1), when the toe-piece (100) of the ski mountaineering binding is in the configuration (O1) of inserted ski boot, to stably maintain the ski boot for ski mountaineering aligned to the longitudinal axis of the ski (S);
characterised in that:

the first hooking element (10) engages in the first seat (12) in such a way as: to be able to perform a roto-translatory motion between a retracted position (PR) and an advanced position (PA) of a plurality of possible advanced positions in which it is more greatly projecting from the first seat (12);
the toe-piece (100) of a ski mountaineering binding is designed in such a way that in the configuration (O1) of the inserted ski boot the first hooking element (10) assumes: the retracted position (PR) when the ski boot (D) for ski mountaineering is aligned to the longitudinal axis of the ski (S); and an advanced position (PA) of the plurality of possible advanced positions when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S).

2. The toe-piece (100) as claimed in claim 1, wherein the first seat (12) is conformed in such a way as to comprise an external housing (121) and an internal housing (122), in communication with one another, and wherein the first hooking element (10) is conformed in such a way as to comprise a first part (111), which is conformed in a complementary way to the external housing (121) of the first seat (12) and which bears the first tip (11), and a second part (112), connected to the first part (111), which is conformed in such a way as to be freely accommodated, with freedom to perform roto-translational movement, in the internal housing (122) of the first seat (12), wherein, in the configuration (O1) of inserted ski boot and with the ski boot (D) for ski mountaineering aligned to the longitudinal axis of the ski (S), the first hooking element (10) is in the retracted position (PR) with the first part (111) inserted and in contact with the external housing (121) of the first seat (12) and with the second part (112) completely inserted in the internal housing (122), and wherein, when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S), the first hooking element (10) assumes at least an advanced position (PA) of the plurality of possible advanced positions with the first part (111) uncoupling, and at least partially exiting from the external housing (121) of the first seat (12) and with the second part (112) performing a roto-translatory movement with respect to the internal housing (122) enabling the first tip (11)

to remain at least partially in contact with the first hole (F1) of the front part (A) of the ski boot (D) for ski mountaineering.

3. The toe-piece (100) as claimed in claim 2 comprising retaining means (3) which are configured to allow the first hooking element (10) to perform a roto-translatory movement from the retracted position (PR) to an extreme advanced end-run position (PAF) of the plurality of possible advanced positions wherein the first hooking element (10) is retained in a configuration of maximum protrusion with respect to the first seat (12).

4. The toe-piece (100) as claimed in claim 3 wherein the retaining means (3) comprise a pin (31, 40), arranged in such a way as to transversally involve the internal housing (122) of the first seat (12), and a slot (32) or recess (42) realised along the second part (112) of the first hooking element (10) and delimited by an external wall (321, 421) and an internal wall (322, 422), with the pin (31) being inserted in the slot (32) or recess (42).

5. The toe-piece (100) as claimed in claim 3, wherein the retaining means (3) comprise at least a spring (4), arranged in such a way as to be in contact with the second part (112) of the first hooking element (10) and which is configured: to allow the first hooking element (10) to assume the retracted position (PR), in the configuration (O1) of the inserted ski boot with the ski boot (D) for ski mountaineering aligned to the longitudinal axis of the ski (S); to allow the first hooking element (10) to assume any advanced position (PA), up to the extreme advanced end-run position (PAF) of the plurality of possible advanced positions, when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S), to allow the first hooking element (10) to return to the retracted position (PR) when the ski boot (D) for ski mountaineering returns into alignment with the longitudinal axis of the ski (S).

6. The toe-piece (100) as claimed in any one of claims 4 and 5, wherein the spring (4) is inserted in a niche (41) made in the second part (112) of the first hooking element (10) in such a way that the spring (4) is in abutment, on a first side, against a wall of the niche (41), and on the other side is in contact with the pin (31) in such a way that the spring (4) is compressed when the first hooking element (10) assumes any advanced position (PA), to the extreme advanced end run position (PAF) of the plurality of possible advanced positions consequently to a misalignment of the ski boot (D) for ski mountaineering with respect to the longitudinal axis of the ski (S), in order to recall the first hooking element (10) towards the retracted position (PR) when the ski boot (D) for ski mountaineering returns into alignment with the longitudinal axis of the ski (S).

7. The toe-piece (100) as claimed in claim 4, wherein the retaining means (3) further comprise at least a magnet (70) configured in such a way as to be able to exert an action of attraction on the second part (112) of the first hooking element (10) which is made of a magnetic material, wherein the at least a magnet (70) is arranged in a cavity (71) made in a wall (73) of the internal housing (122) of the first seat (12) present in the first jaw (1).

8. The toe-piece (100) as claimed in any one of the preceding claims, wherein the second jaw (2) comprises a second seat (22) for partially receiving the second hooking element (20), so that the second tip (21) exits from the second seat (22), wherein the second hooking element (20) engages in the second seat (22) in such a way as: to be able to carry out a roto-translatory motion between a retracted position (VR) and an advanced position (VA) of a plurality of possible advanced positions in which it is more projecting from the second seat (22);
the toe-piece (100) of a ski mountaineering binding is designed in such a way that, in the configuration (O1) of an inserted ski boot, the second hooking element (20) assumes: the retracted position (VR) when the ski boot (D) for ski mountaineering is aligned to the longitudinal axis of the ski (S); and an advanced position (VA) of the plurality of possible advanced positions when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S).

9. The toe-piece (100) as claimed in claim 8, wherein the second seat (22) is conformed in such a way as to comprise a second external housing (221) and a second internal housing (222), in communication with one another, and wherein the second hooking element (20) is conformed in such a way as to comprise a first part (211), which is conformed in a complementary way to the second external housing (221) of the second seat (22) and which bears the second tip (21), and a second part (212), connected to the first part (211), which is conformed in such a way as to be freely accommodated, with freedom to perform roto-translational movement, within the second internal housing (222) of the second seat (22), wherein, in the configuration (O1) of inserted ski boot and with the ski boot (D) for ski mountaineering aligned to the longitudinal axis of the ski (S), the second hooking element (20) is in the retracted position (VR) with the first part (211) inserted and in contact with the second external housing (221) of the second seat (22) and with the second part (212) completely inserted in the second internal housing (222), and wherein, when the ski boot (D) for ski mountaineering

temporarily misaligns with respect to the longitudinal axis of the ski (S), the second hooking element (20) assumes at least an advanced position (VA) of the plurality of possible advanced positions with the first part (211) which uncouples, at least partially, from the second external housing (221) of the second seat (22) and with the second part (212) performing a roto-translatory movement with respect to the second internal housing (222) enabling the second tip (21) to remain at least partially in contact with the second hole (F2) of the front part (A) of the ski boot (D) for ski mountaineering.

10. The toe-piece (100) as claimed in claim 9 comprising second retaining means (5) which are configured to enable the second hooking element (20) to perform a roto-translatory movement from the retracted position (VR) to an extreme advanced end-run position (VAF) of the plurality of possible advanced positions, wherein the second hooking element (20) is retained in a configuration of maximum protrusion with respect to the second seat (22).

11. The toe-piece (100) as claimed in claim 10 wherein the second retaining means (5) comprise a second pin (51) arranged in such a way as to transversally involve the second internal housing (222) of the second seat (22) and a second slot (52) or recess made along the second part (212) of the second hooking element (20) and delimited by an external wall (521) and an internal wall (522), with the second pin (51) being inserted in the second slot (52) or recess.

12. The toe-piece (100) as claimed in claim 10, wherein the second retaining means (5) comprise at least a second spring (6), arranged in such a way as to be in contact with the second part (212) of the second hooking element (20) and which is configured: to allow the second hooking element (20) to assume the respective retracted position (VR), in the configuration (O1) of the inserted ski boot with the ski boot (D) for ski mountaineering aligned to the longitudinal axis of the ski (S); to allow the second hooking element (20) to assume any respective advanced position (VA), up to the extreme advanced end-run position (VAF), when the ski boot (D) for ski mountaineering temporarily misaligns with respect to the longitudinal axis of the ski (S); to allow the second hooking element (20) to return into the respective retracted position (VR) when the ski boot (D) for ski mountaineering returns into alignment with the longitudinal axis of the ski (S).

13. The toe-piece (100) as claimed in any one of claims 11 and 12, wherein the second spring (6) is inserted in a second niche (61) made in the second part (212) of the second hooking element (20) in such a way that the second spring (6) is in abutment, on a first side, against a wall of the niche (61), and on the other side is in contact with the second pin (51) in such a way that the spring (6) is compressed when the second hooking element (20) assumes a respective any advanced position (VA), up to the extreme advanced end run position (VAF), of the plurality of possible advanced positions consequently to a misalignment of the ski boot (D) for ski mountaineering with respect to the longitudinal axis of the ski (S), to recall the second hooking element (20) towards the respective retracted position (VR) when the ski boot (D) for ski mountaineering returns into alignment with the longitudinal axis of the ski (S).

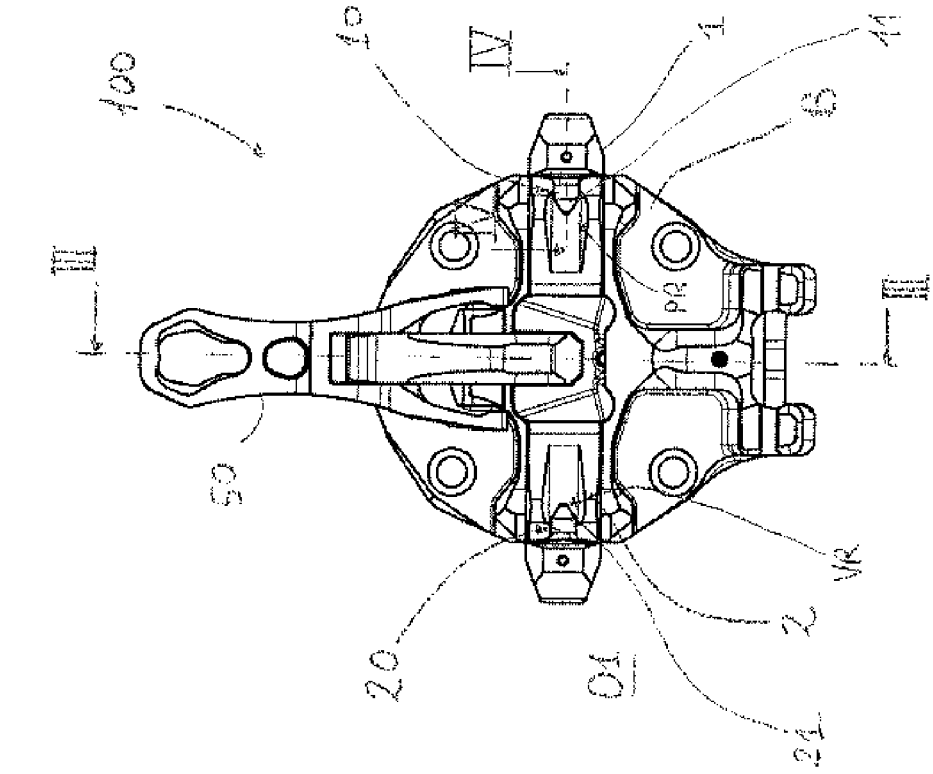

100
10
IV
1
11
8
III
III
50
R2
VR
2
20
01
24

FIG.2

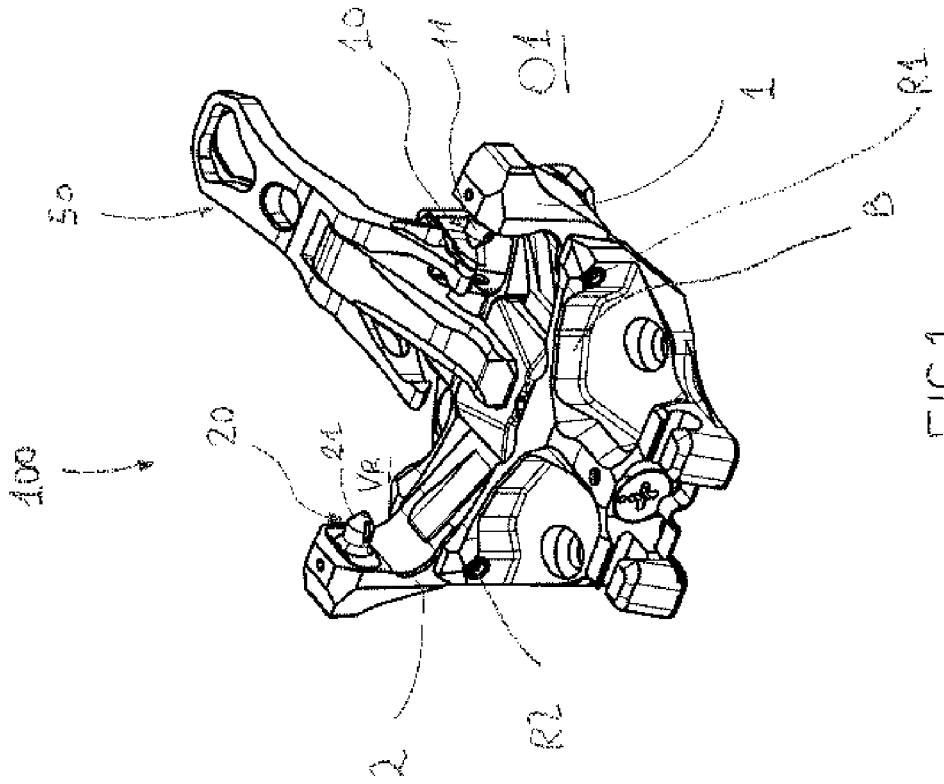

10
11
01
1
R1
50
8
100
20
21
VR
2
R2

FIG.1

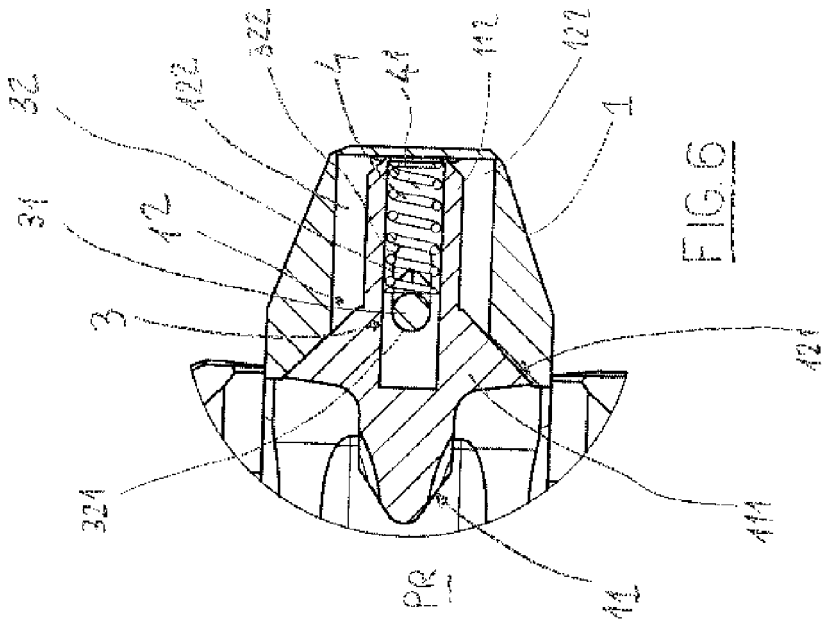


FIG.6

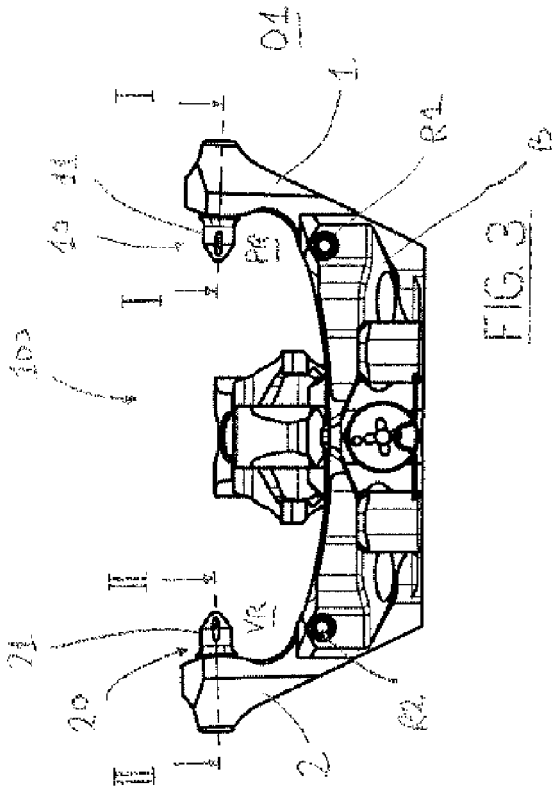


FIG.3

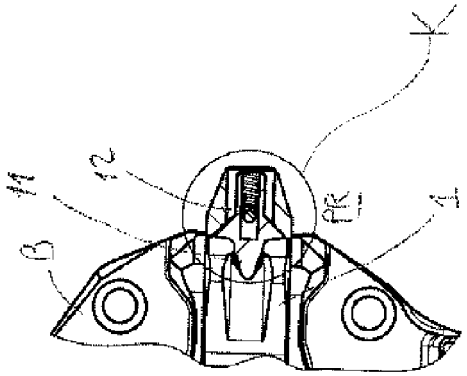


FIG.4

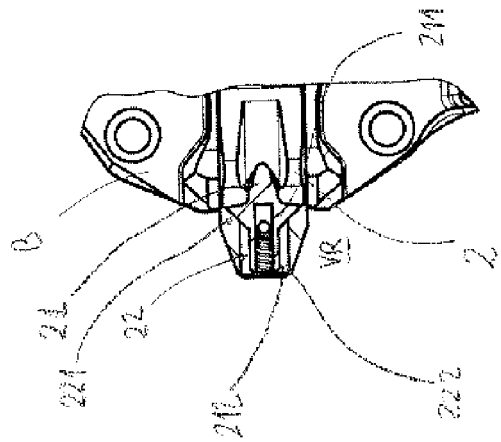


FIG.5

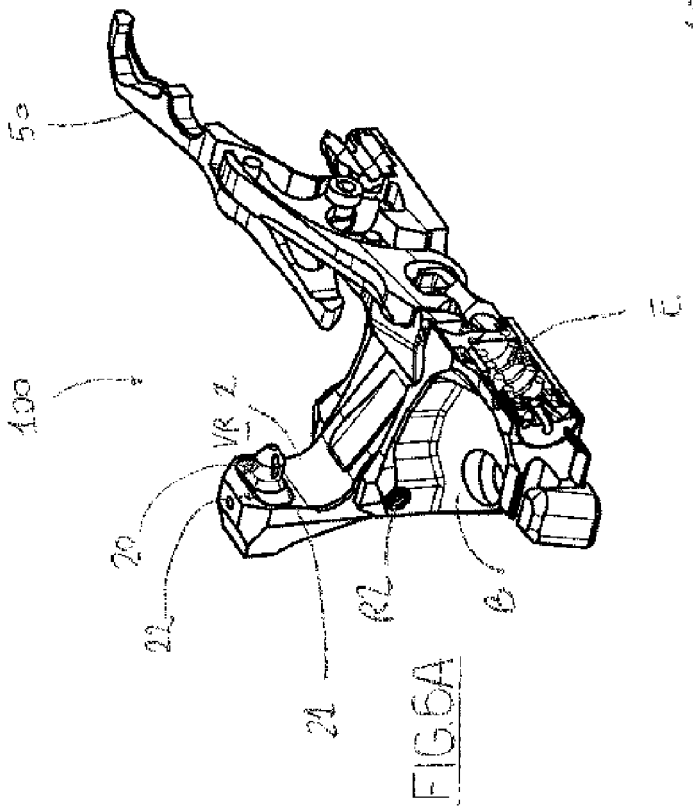


FIG.6A

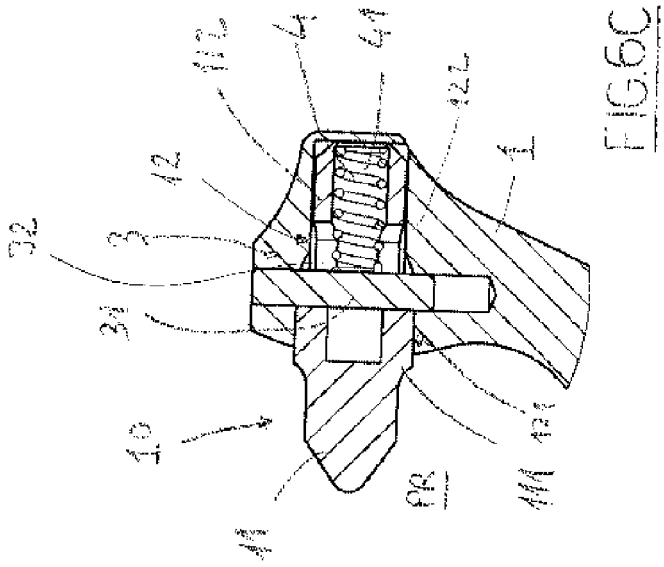


FIG.6C

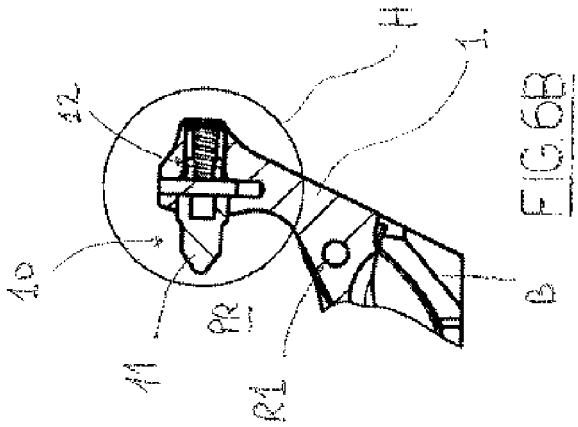


FIG.6B

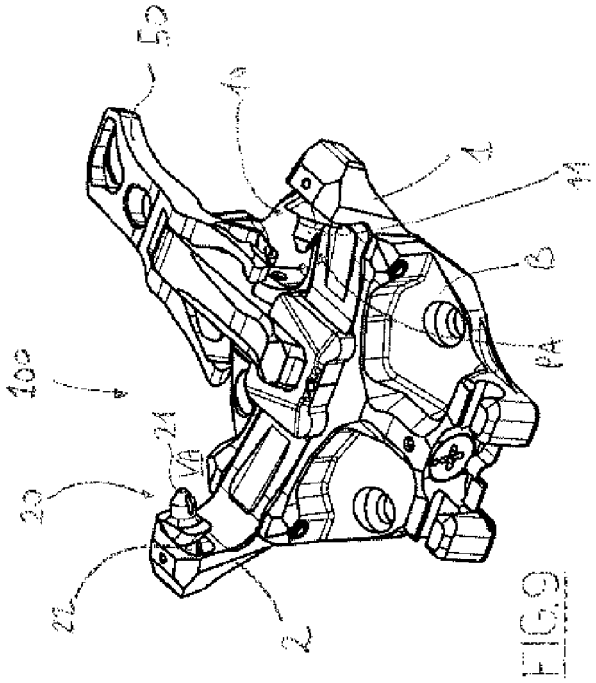


FIG.9

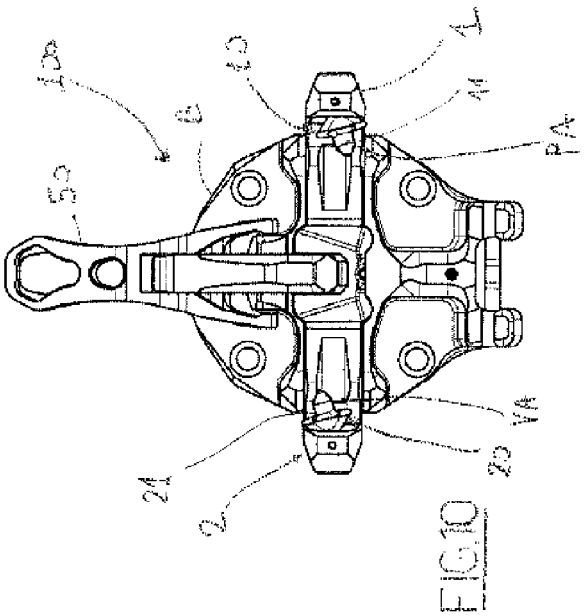


FIG.10

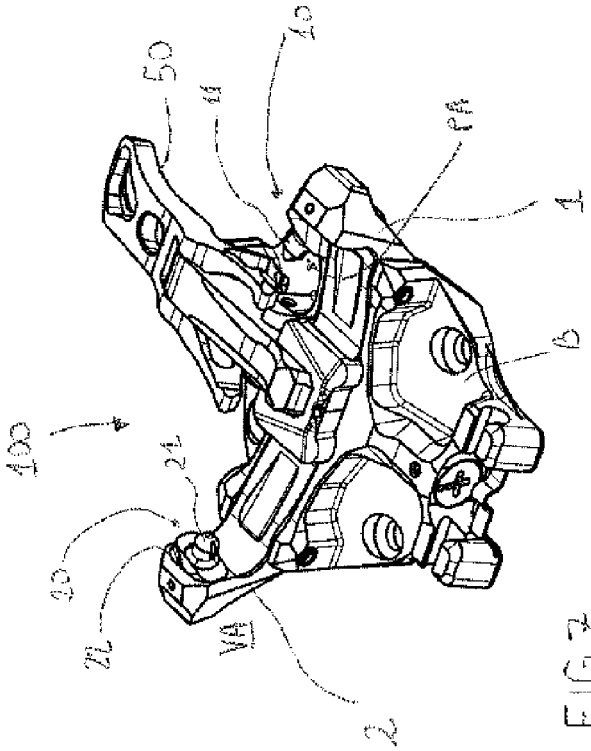


FIG.7

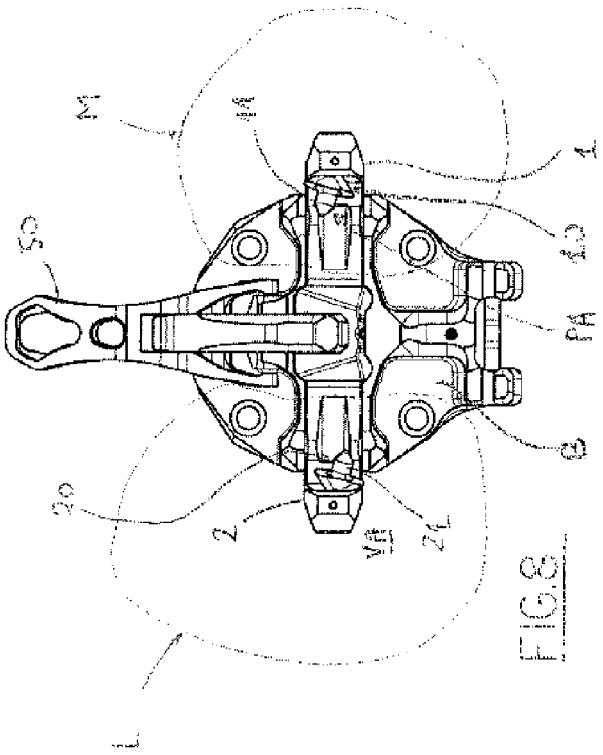


FIG.8

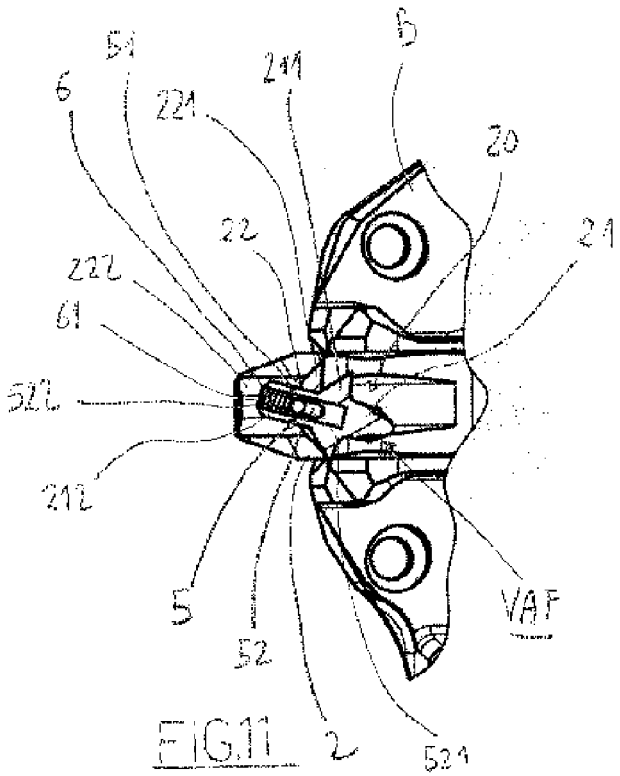


FIG.11

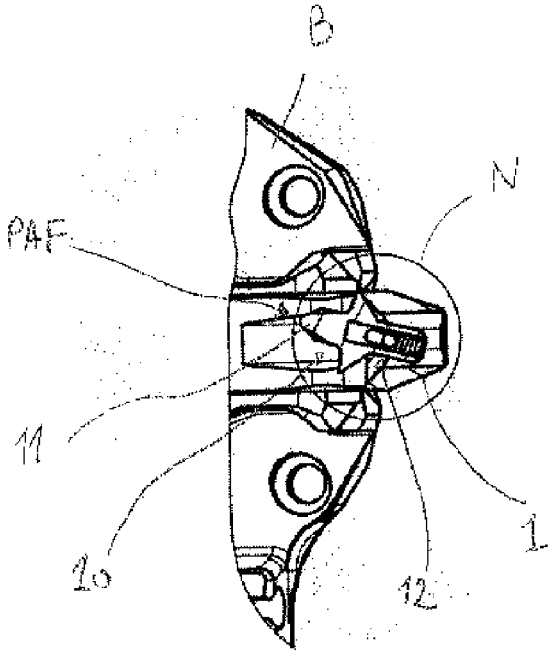


FIG.12

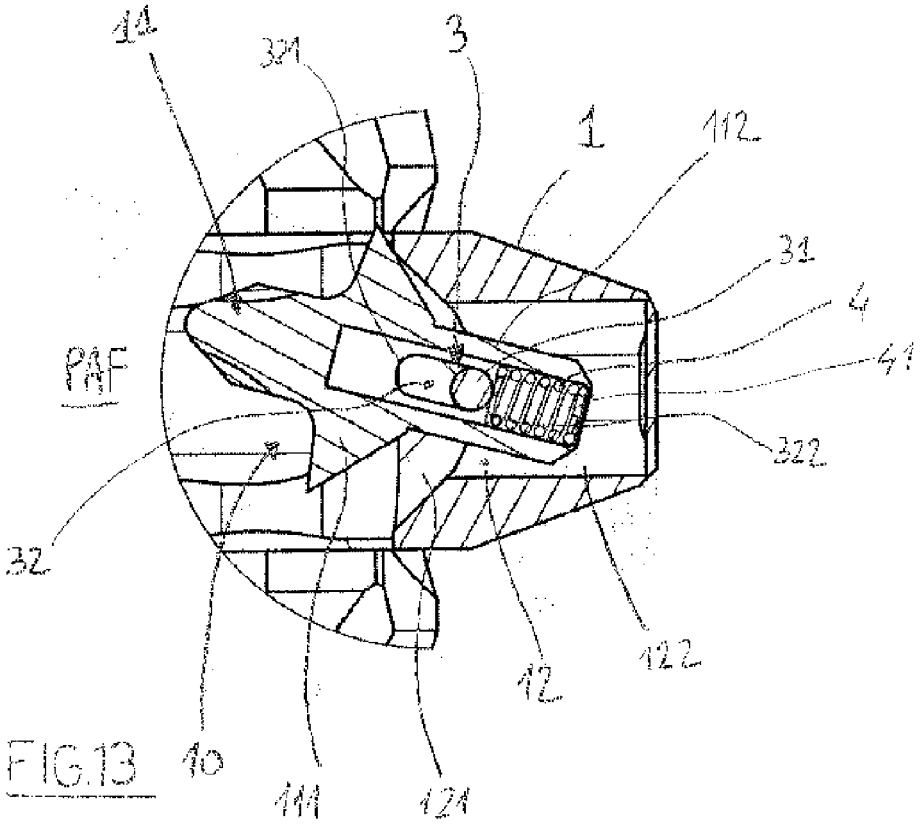


FIG.13

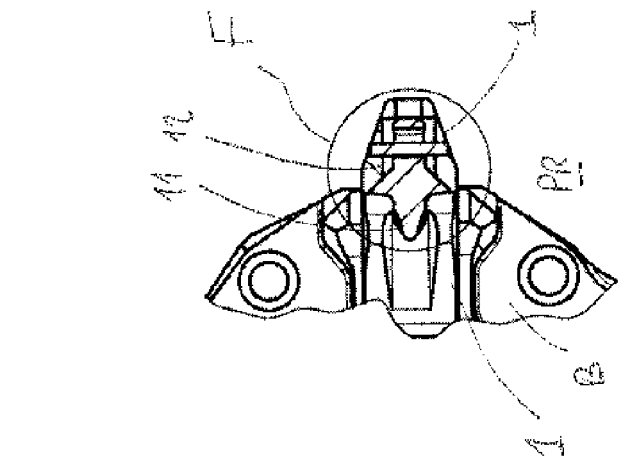


FIG.13B

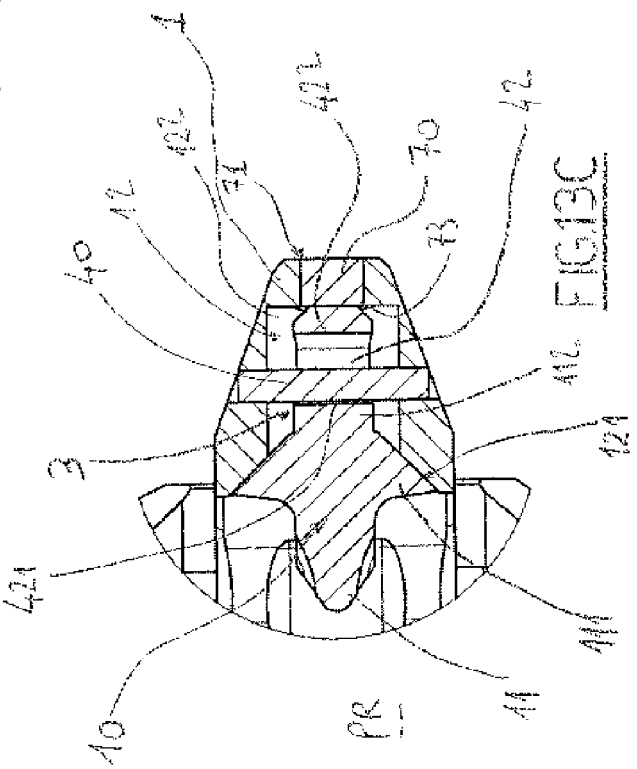


FIG.13C

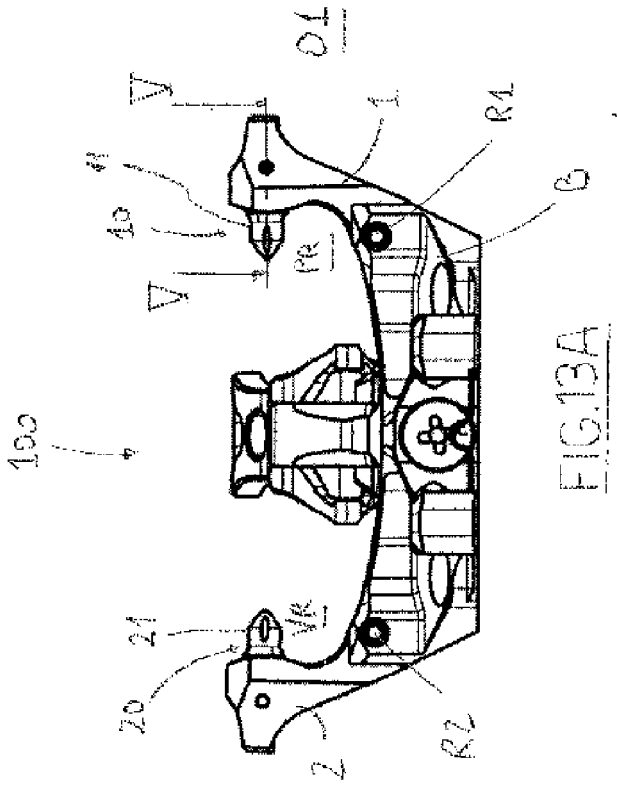


FIG.13A

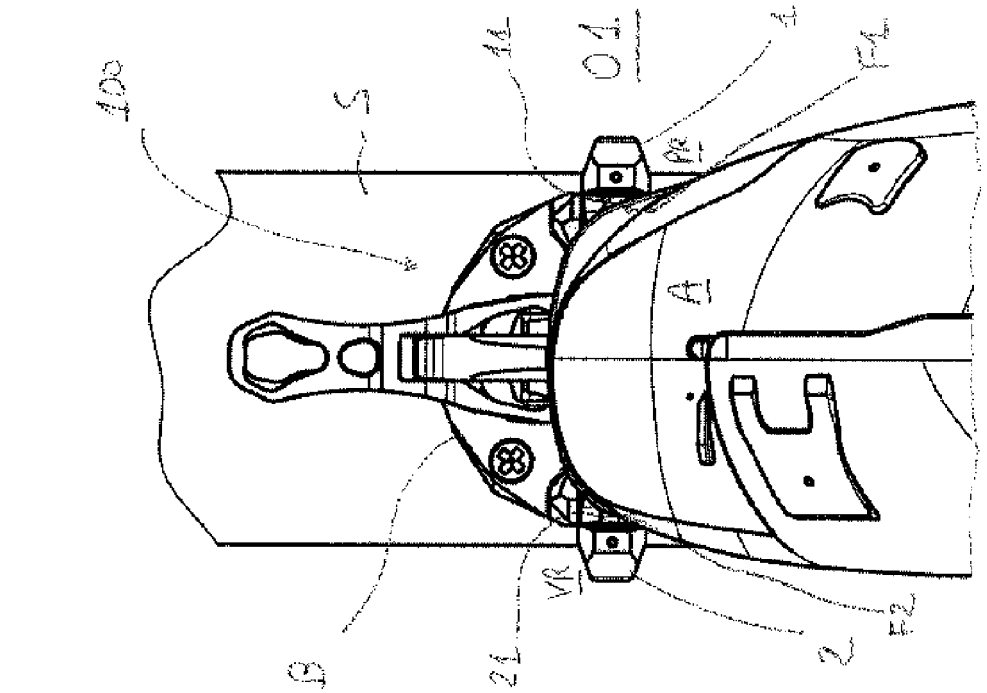


FIG 15

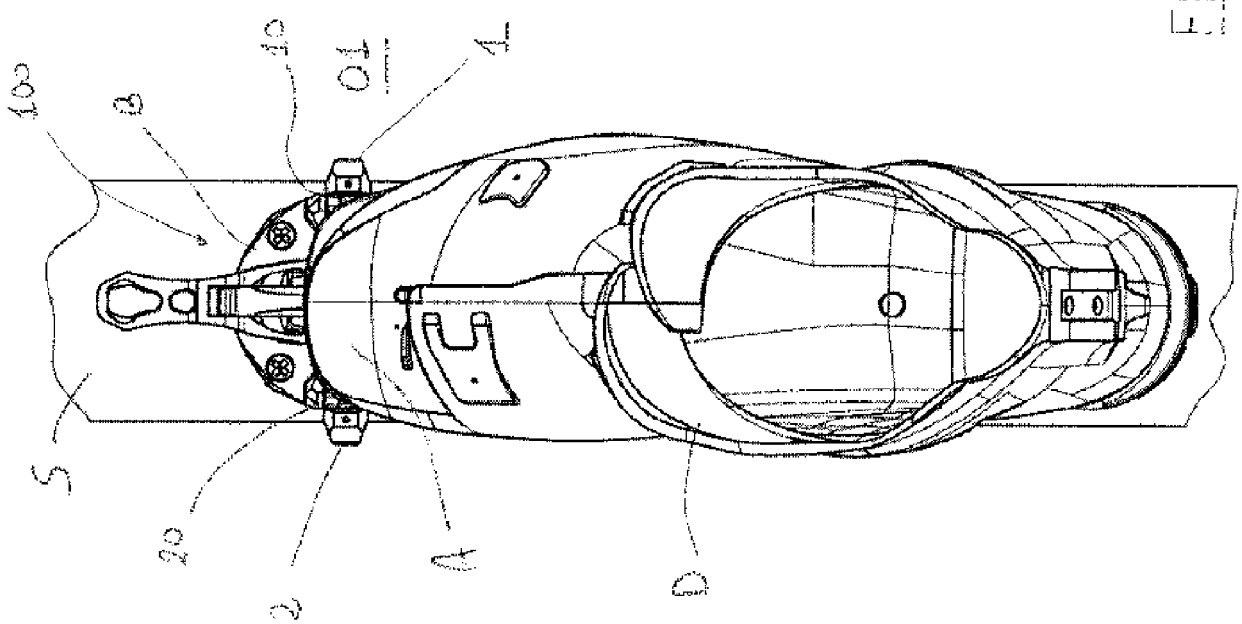


FIG 14

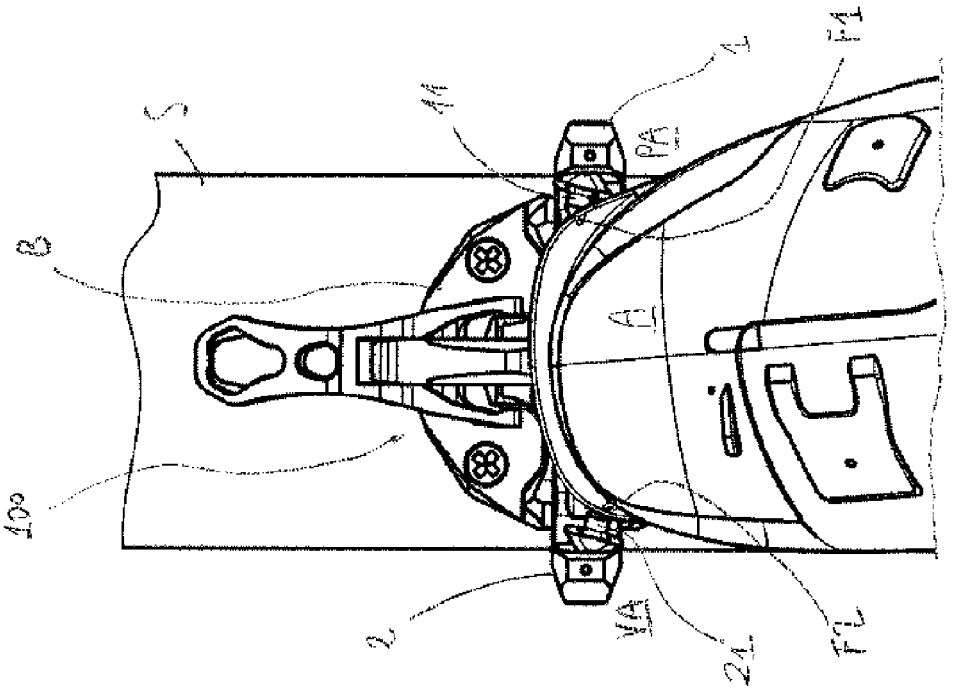


FIG.17

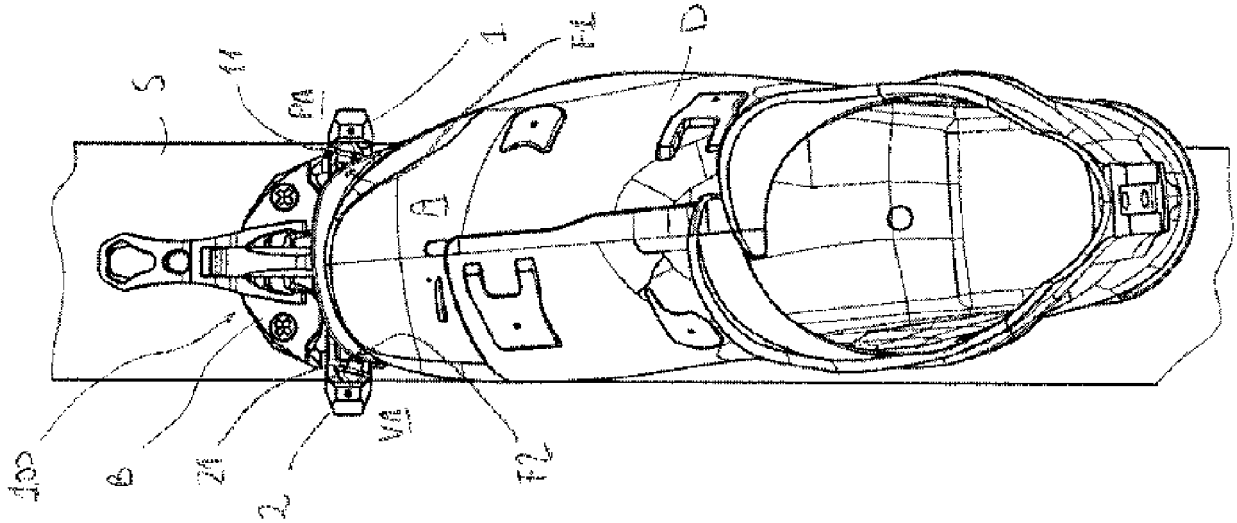


FIG.16

FIG.17

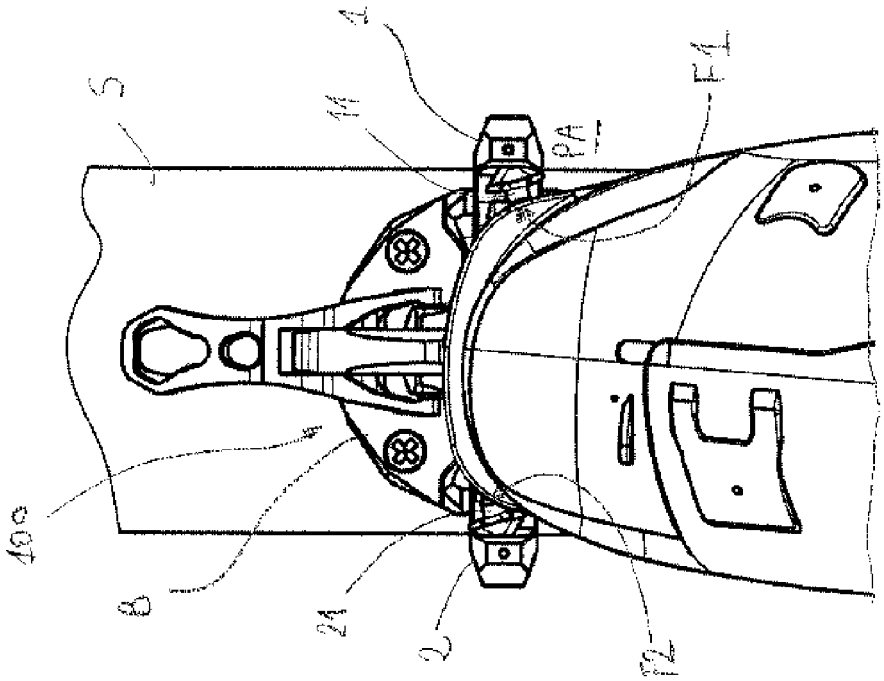
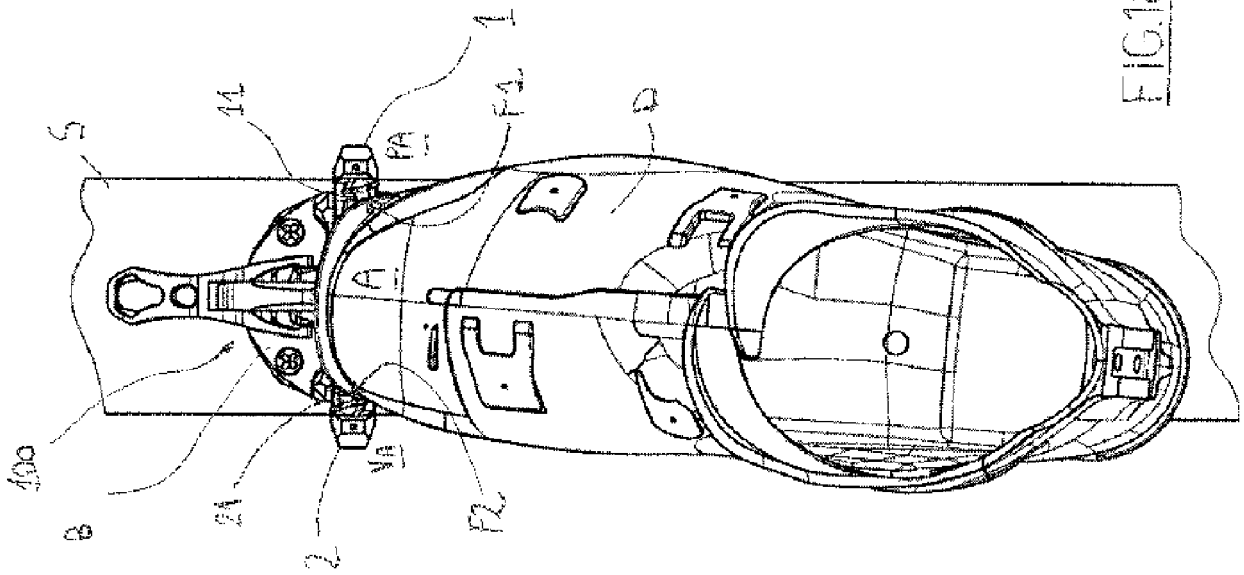


FIG.18



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EUROPEAN SEARCH REPORT

Application Number
EP 24 15 9504

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 3 915 423 A1 (ATK SPORTS S R L [IT]) 1 December 2021 (2021-12-01) * paragraph [0029] - paragraph [0092]; claims; figures *	1-13	INV. A63C9/08
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A63C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 June 2024	Endrizzi, Silvio

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 15 9504

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