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Olivieri

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[54] **SKI-BOOT FASTENING DEVICE WITH AN ADJUSTABLE-LENGTH TIE ROD FOR VARYING THE TENSION OF THE FASTENING UNDER LOAD**

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[52] **U.S. Cl.** ..... **24/68 SK**; 24/69 SK; 24/70 SK

[58] **Field of Search** ..... 24/68 SK, 70 SK, 69 SK, 24/71 SK, 70 J, 71 J

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[57] **ABSTRACT**

A ski-boot fastening device for allowing the fastening tension to be adjusted under load includes a ring or other similar hook means and a tensioning unit which acts on the hook means through a tie rod comprising a rod-shaped element having a section with a plurality of transverse notches which are longitudinally aligned along the section, a substantially plate-shaped body with a hole extending parallel to the line of action of the tie rod and having dimensions so as to couple with at least the notched section of the rod-shaped element, and a seat formed in the substantially plate-shaped body. The seat opens into the hole in the plate-shaped body, and a locking member is mounted in the seat and guided for movement transverse the hole against the action of spring means so as to releasably engage a notch of the notched section of the rod-shaped element.

14 Claims, 6 Drawing Figures

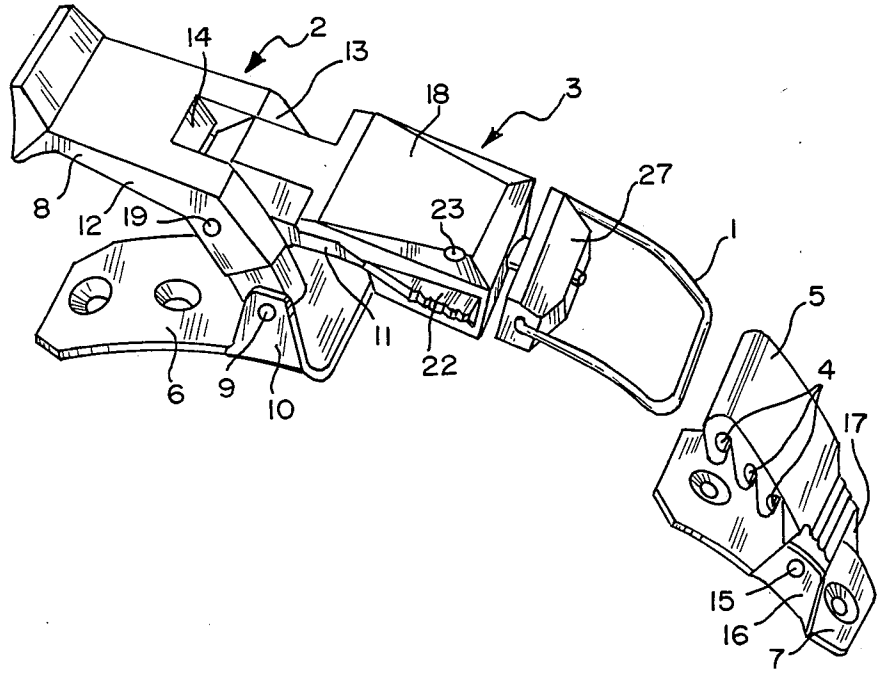


FIG. 1

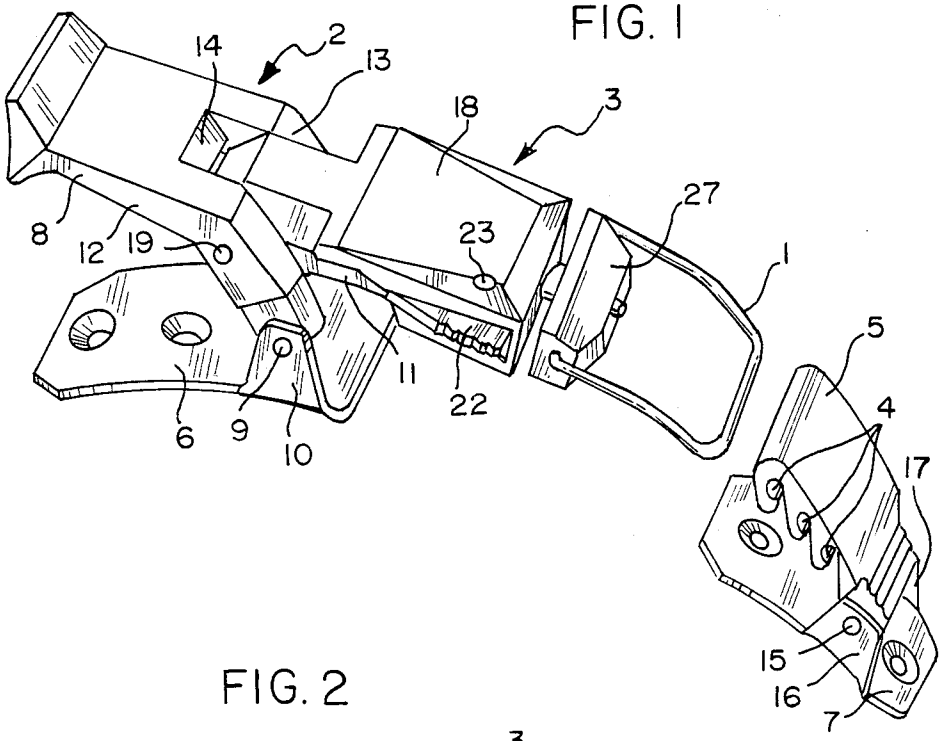


FIG. 2

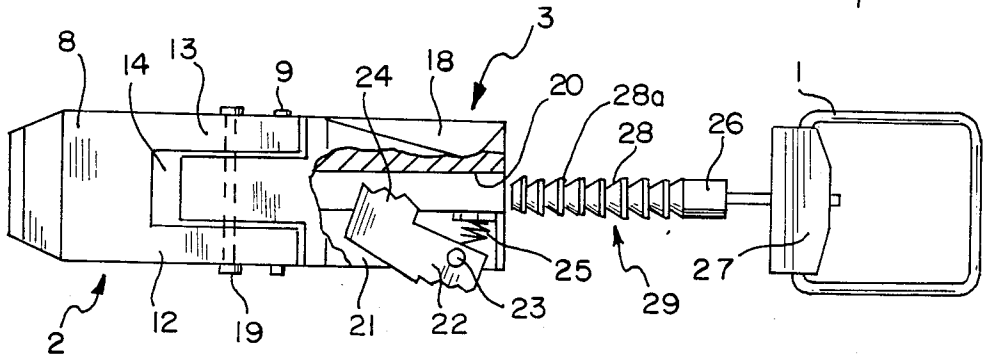


FIG. 3

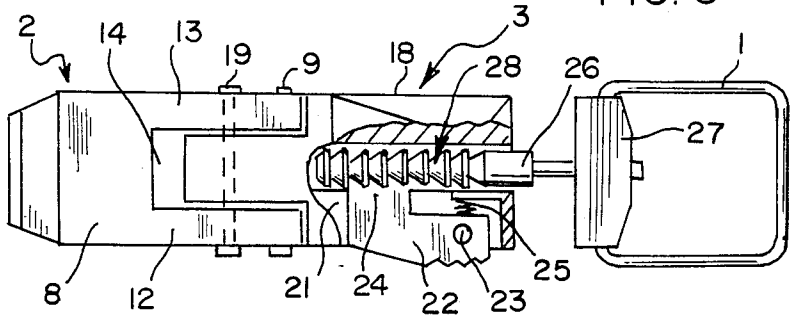


FIG. 4

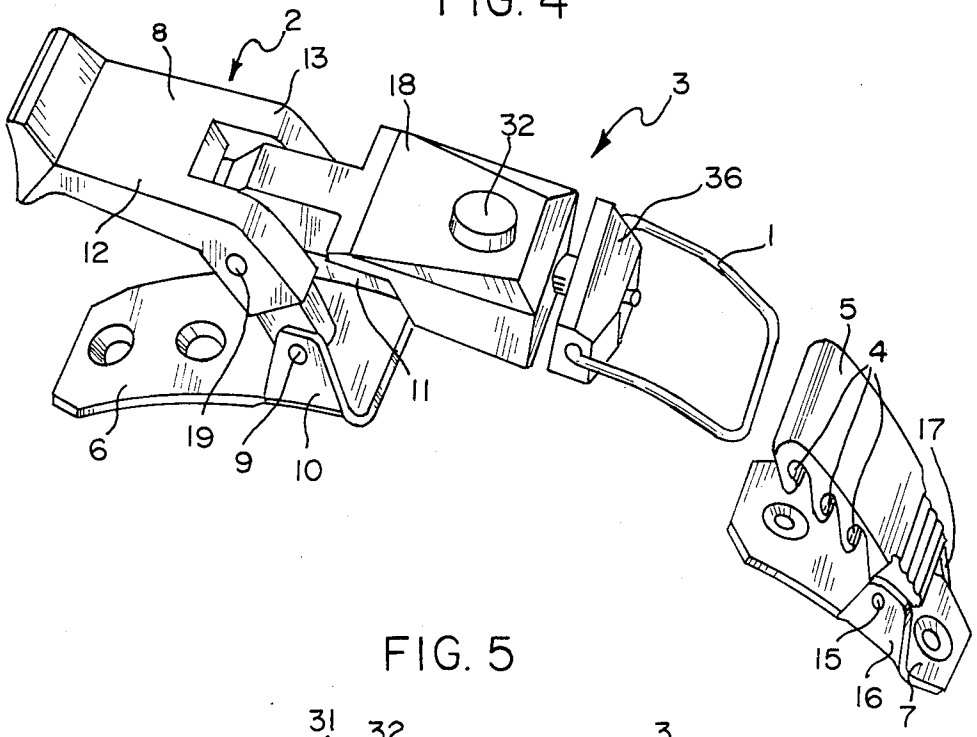


FIG. 5

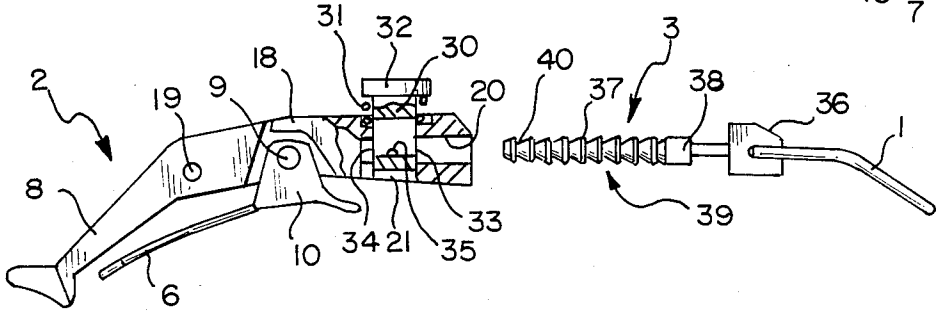
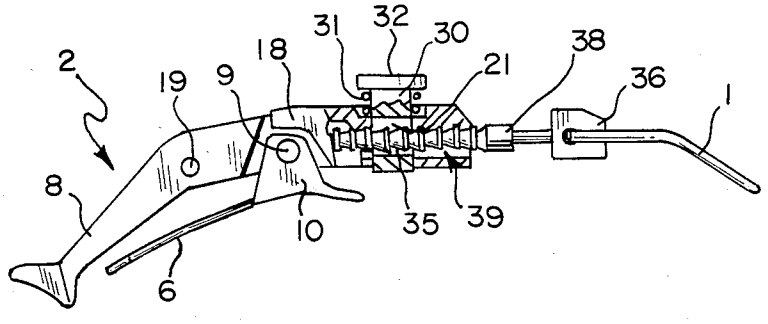


FIG. 6



SKI-BOOT FASTENING DEVICE WITH AN ADJUSTABLE-LENGTH TIE ROD FOR VARYING THE TENSION OF THE FASTENING UNDER LOAD

The present invention relates to a ski-boot fastening device comprising members which allow the adjustment of the fastening tension.

It is known that one of the devices most widely used for the fastening of ski-boots comprises basically a plate having a plurality of hooked seats which are identical and parallel to each other and an arcuate, generally rectangular-sectional metal ring one side of which is intended releasably to engage one of the hooked seats while the other side is fixed to the end of a tensioning unit. A tensioning unit generally comprises a plate-shaped base on which a second-order lever is pivoted, a rod-shaped tie rod having one end pivoted at the point of resistance of the lever and its other end fixed to said side of the metal ring.

It is also known that, while a coarse adjustment of the fastening tension can be achieved by successively engaging the ring with different hooked seats, for fine adjustment of the tension it is necessary to adjust the length of the tie rod. For this purpose, the tie rid is generally formed with a screw-threaded end portion for engaging a nut associated with the metal ring or, in an entirely equivalent manner, the tie rod is made rigid with a nut which engages a threaded shaft associated with the metal ring.

Although advantageous from various points of view, such ski-boot fastening devices have a technical disadvantage linked with the manner in which the fine adjustment of the fastening tension is achieved, which has not been overcome until now.

Indeed, for this adjustment, it is always necessary to disengage the ring from the respective hooked seat, operate the screw-nut coupling between the ring and the tie rod, and then re-engage the ring in the same hooked seat to check the degree of tensioning reached. The desired value is generally achieved after several operations of this type which, particularly when effected under unfavourable conditions generally found during skiing, may discourage the user to the extent of making him desist from carrying out a desired and appropriate adjustment.

The main object of the present invention is to overcome this disadvantage, an object which is achieved by a ski-boot fastening device of the type in which a ring or other similar hook means is acted upon by a tensioning unit through a tie rod, characterised in that the tie rod comprises:

a rod-shaped element having a plurality of transverse notches which are aligned longitudinally along at least one section of the rod-shaped element,

a substantially plate-shaped body having a hole extending parallel to the line of action of the tie rod and having dimensions so as to couple with at least the second of the rod-shaped element having notches,

a seat formed in the substantially plate-shaped body which opens into the hole,

a locking member mounted in the seat and guided for movement transverse the hole against the action of spring means releasably to engage a notch in said section of the rod-shaped element.

In accordance with one embodiment of the device of the invention, the locking member comprises a hook pivoted in the seat and having one part accessible from outside the body, a spring resisting the disengagement of the hook from a notch in the said section of the rod-shaped element.

To advantage, and in accordance with another embodiment, the locking member comprises a slider having one part accessible from outside the body and being provided with an aperture which has transverse dimensions greater than the transverse dimensions of the rod-shaped element, the slider being manually movable, in the seat and against the spring means, between a first position in which the aperture is aligned with the hole and a second position in which the aperture and the hole are not aligned, with the effect of locking the rod-shaped element in correspondence with one of its transverse notches.

Further characteristics and advantages of a ski-boot fastening device according to the invention will become clearer from the description of one embodiment, which follows, purely by way of non-limiting example.

IN THE DRAWINGS

FIG. **1** is a perspective view of a fastening device according to the present invention;

FIG. **2** is a view of a detail of the device of the preceding Figure, with its parts separated and in partial section;

FIG. **3** shows the detail of FIG. **2** in a condition of use;

FIG. **4** is a perspective view of a fastening device according to a variant embodiment;

FIG. **5** shows a detail of the device of FIG. **4** with its parts separated and in partial section,

FIG. **6** shows the same detail of FIG. **5** in a condition of use.

With reference to the drawings, a ski-boot fastening according to the invention is of the type in which a ring **1** or other similar hook element is acted upon by a tensioning unit, generally indicated **2**, through a tie rod **3**, and is intended releasably to engage one hooked seat **4** of a plurality of seats with which a plate-shaped lever **5** is provided.

Both the tensioning unit **2** and the plate-shaped lever **5** are fixed in a conventional manner by respective plate-shaped bases **6**, **7** in predetermined positions on the upper of a ski-boot (not shown).

More particularly, the tensioning unit **2** is constituted essentially by a second-order lever **8** pivoted on a pin **9** carried by lugs **10**, **11** defined by the base plate **6**. The lever **8** is of the forked type with prongs **12**, **13** which are mutually spaced apart by a distance **14** of predetermined amount.

The plate-shaped lever **5** is also mounted on a pin **15** carried by lugs **16**, **17** on the plate-shaped base **7**.

The tie rod **3** comprises a plate-shaped body **18** rotatably mounted along one of its transverse sides about a pin **19** carried by the prongs **13**, **12** of the lever **8**. The plate-shaped body **18** has a hole **20** extending in the direction of the line of force of the tie rod **3**. The plate-shaped body **18** is also formed with a seat **21** which opens into the hole **20** and is accessible from outside the aforesaid body **18**. In the seat **21** is located a hook **22** which is rotatably mounted on a pin **23** about which the hook is angularly displaceable from a withdrawn position in the seat **21** to a position in which its active end **24** hooks into the hole **20**. The hook **22** is biased into this

second position (the operative position) by a return spring **25** mounted on the pin **23** and active on the hook in known manner.

The tie rod **3** further includes a cylindrical rod-shaped element **26** having one end attached, for example, fixed or pivoted, to a plate **27** which supports the ring **1** or other similar hook element in conventional manner.

The rod-shaped element **26** has a plurality of transverse, longitudinally-aligned notches **28** on a section **29** of the rod-shaped element itself which includes its end opposite that previously considered.

More particularly, and in accordance with a preferred embodiment, the notches **28** are annular and define a plurality of annular teeth **28***a* in the section **29**, the sides of the teeth facing the free end of the rod-shaped element **26** having a conical outward taper.

The second **29** is releasably, axially engageable in the hole **20** of the plate-shaped body **18** described above. Consequently, the hole **20** has a depth and transverse dimensions substantially matching those of the section **29** of the rod-shaped element **26**.

The fine adjustment of the degree of fastening tension achieved by the device of the invention may be effected very quickly and simply.

Indeed, for this purpose, it suffices to operate the hook **22** so as to disengage the active end **24** from a notch **28** in which it was previously engaged, and then engage the rod-shaped element **26** in, or disengage it from, its hole **20** in the plate-shaped body **18** as desired, with a consequent variation in the length of the tie rod **3**. The new configuration of the tie rod is then fixed by leaving the hook **22** re-engaged in a new notch **28** of the rod-shaped element **26**.

It should be noted that this fine adjustment of the degree of fastening tension occurs rapidly and easily when the fastening itself is "under load".

Thus, the characteristic disadvantages of the devices of the prior art, in which the adjustment of the tension of the fastening must be effected under "open" or "loosened" conditions of the device, are advantageously and finally overcome. It should also be noted that the annular shape of the notches **28**, and hence of the teeth **28***a*, with radial engagement of these by the hook **22**, allows the cylindrical rod-shaped element **26** to rotate about its longitudinal axis.

When these rotations are not desired, it suffices to form the rod-shaped element **26** with a rectangular (or square) cross-section and also form the hole **20** in the plate-shaped body **18** with a rectangular (or square) section.

Finally, it should be noted that the seat **21** with its hook **22** is preferably formed along one side of the plate-shaped body **18**. Obviously, the seat **21** may be formed in any other position in the plate-shaped body **18** as long as the hook **22** located therein interferes with the section **29** of the rod-shaped element **26** when engaged in the hole **20**.

According to the variant illustrated in FIGS. **4**, **5** and **6**, a slider **30** acted upon by a return spring **31** is slidable in the seat **21** in the body **18**.

In accordance with a preferred but not exclusive embodiment, the slider **30** has a square cross-section and the cross-section of the seat **21** in which the slider is rotatably engaged is also square. The slider **30** has one end **32** accessible from outside the body **18** and has a through hole constituted by two portions **33**, **34** separated by an annular lip **35** of a diameter substantially equal to the diameter of the hole **20**. The slider **30** is movable in the seat **21** against the action of the spring **31** between a first position in which the holes **33**, **34** are aligned with the hole **20** and a second position in which the holes **33**, **34**, and **20** are not aligned, the spring **31** biassing towards this second position.

The tie rod **3** further includes a cylindrical rod-shaped element **38** having one end attached, for example, fixed or pivoted, to a plate **36** which supports the ring **1** or other similar hook element.

The rod-shaped element **38** has a plurality of transverse, longitudinally-aligned notches **37** in a section **39** of the rod-shaped element itself, a section which includes the free end of the rod-shaped element.

More particularly, and in accordance with a preferred embodiment, the notches **37** are annular and define a corresponding plurality of annular teeth **40** in the section **39**, the sides of which facing the free end of the rod-shaped element **38** have a conical outward taper.

The section **39** is releasably, axially engageable in the hole **20** in the plate-shaped body **18** with simultaneous engagement in the hole **33**, **34** of the slider **30**. Consequently, the hole **20** has a depth equal to or greater than the length of the section **38**, while it has a diameter only slightly greater than the outer diameter of the cylindrical rod-shaped element **38**.

For the fine adjustment of the degree of fastening tension achieved according to this variant, it suffices to operate the slider **30** so as to bring it, against the action of the spring **31**, into the first position in which the hole **33**, **34** is aligned with the hole **20**. In this position, the rod-shaped element **38** is free to be engaged in or disengaged from the plate-shaped body **18** as desired, with the consequent variation in length of the tie rod. The new configuration of this tie-rod is then fixed by leaving the slider **30** to take up the position of biassing by the spring **31**, in which the holes **33**, **34** and **20** are not aligned. In this position, the annular lip **35** within the slider **30** engages a notch **37** of the rod-shaped element.

With regard to the slider **30**, it is clear that this may be formed by a plate-shaped element or by an element of similar configuration, or again may have a cylindrical tubular form with means for preventing its rotation in the seat **21**, without thereby departing from the scope of the present invention as described above and as claimed below.

What is claimed is:

1. A ski-boot fastening device for allowing the adjustment of the fastening tension under load, of the type including ring-like hook means, a tensioning unit, and a tie rod by means of which the tensioning unit acts on the hook means, wherein the improvement consists in said tie rod comprising:

a rod-shaped element having at least one section with a plurality of transverse notches which are longitudinally aligned therealong;

a substantially plate-shaped body defining a hole which extends parallel to the line of action of said tie rod and has dimensions so as to couple with at least said notched section of the rod-shaped element;

a seat formed in the substantially plate-shaped body and opening into said hole;

a locking member mounted in said seat and guided for movement transverse said hole to releasably engage a notch of said section of the rod-shaped element, and

resilient means which oppose the movement of said locking member transverse said hole.

2. A device as defined in claim 1, wherein the locking member comprises a hook pivoted in said seat and having one part accessible from outside the plate-shaped body and a spring resists the disengagement of said hook from a notch of said section of the rod-shaped element.

3. A device as defined in claim 1, wherein said locking member comprises a slider having one end accessible from outside said plate-shaped body and defining an aperture with transverse dimensions greater than the transverse dimensions of the rod-shaped element, said slider being movable manually in said seat between a first position in which said aperture is aligned with said hole and a second position in which said aperture and said hole are out of alignment and said rod-shaped element is locked in correspondence with one of its said transverse notches, spring means opposing said movement of said slider.

4. A device as defined in claim 3, wherein the slider is constituted by a square-sectioned element having a through hole, said through hole being provided internally with an annular lip.

5. A ski-boot fastening device including hook means, a tensioning unit, and a tie rod by which the tensioning unit acts on the hook means, said tie rod comprising:

a rod-shaped element having a circular cross-section and at least one section with a plurality of transverse annular notches which are longitudinally aligned along said rod-shaped element, said notches defining a plurality of annular teeth tapered conically towards a free end of said rod-shaped element for allowing adjustment of the rod-shaped element under a fastening tension;

a substantially plate-shaped body defining a hole extending parallel to the path of travel of said tie rod and is dimensioned to receive at least said notched section of the rod-shaped element;

a seat formed in the substantially plate-shaped body and opening into said hole;

a locking member mounted in said seat and guided for movement transverse said hole to releasably engage an annular notch of said section of the rod-shaped element; and

resilient means opposing the movement of said locking member transverse said hole.

6. A device as defined in claim 5, wherein the locking member comprises a hook pivoted in said seat and having one part accessible from outside the plate-shaped body and a spring resists the disengagement of said hook from a notch of said section of the rod-shaped element.

7. A device as defined in claim 5, wherein said locking member comprises a slider having one end accessible from outside said plate-shaped body and defining an aperture with transverse dimensions greater than the transverse dimensions of the rod-shaped element, said slider being movable in said seat between a first position in which said aperture is aligned with said hole and a second position in which said aperture and said hole are out of alignment and said rod-shaped element is locked in correspondence with one of its said transverse annular notches, spring means opposing said movement of said slider.

8. A device as defined in claim 5, wherein the slider comprises a square-sectioned element defining a through hole, said through hole being provided internally with an annular lip.

9. A ski-boot fastening device, said fastening device comprising:

hook means;

a tensioning unit; and

tie rod means interconnecting said hook means and said tensioning unit for adjusting the fastening tension between said hook means and said tensioning unit under a load force, said tie rod means comprises

a rod-shaped element connected at one end to said hook means and including at least one section with a plurality of transverse notches longitudinally aligned therealong,

a body member connected at one end to said tensioning unit and defining a hole extending from the other end of said body member parallel to the path of travel of said tie rod means and dimensioned to receive at least said notched section of the rod-shaped element,

a seat formed in the body member and opening into said hole,

a locking member mounted in said seat and guided for movement transverse said hole to releasably engage a notch of said section of the rod-shaped element, and

resilient means opposing the movement of said locking member transverse said hole for biasing said locking member into engagement with said section of the rod-shaped element when said section is received in said hole under a fastening tension.

10. A device as defined in claim 9, wherein the locking member comprises a hook pivoted in said seat and having one part accessible from outside the body member and a spring resists the disengagement of said hook from a notch of said section of the rod-shaped element.

11. A device as defined in claim 9, wherein the rod-shaped element has a circular cross-section and the notches are annular, said notches defining a plurality of annular teeth.

12. A device as defined in claim 11, wherein said annular teeth have sides which are tapered conically towards the free end of said rod-shaped element.

13. A device as defined in claim 9, wherein said locking member comprises a slider having one end accessible from outside said body member and defining an aperture with transverse dimensions greater than the transverse dimensions of the rod-shaped element, said slider being movable in said seat between a first position in which said aperture is aligned with said hole and a second position in which said aperture and said hole are out of alignment and said rod-shaped element is locked in said hole in correspondence with one of its said transverse notches, spring means opposing said movement of said slider.

14. A device as defined in claim 13, wherein the slider comprises a square-sectioned element defining a through hole, said through hole being provided internally with an annular lip.

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