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(54) Device for adjusting the centre distance between the binding means of a ski binding

(57) The present invention refers to a device for adjusting the centre distance between the binding means of a ski binding, comprising: a first and a second carriage (3, 4) slidably associable to a plate (2, 2a, 2b) which is in turn associable to a ski and extends along a longitudinal axis essentially parallel to the longitudinal extension of the ski; the first and the second carriages (3, 4) are adapted to support respective binding means for a ski boot. The device further comprises linking means for mutually linking the first and the second carriages (3, 4) and capable to cause a simultaneous and synchronous sliding motion of the first and second carriages (3, 4) along the longitudinal axis of the plate (2, 2a, 2b) in mutually opposed directions; the linking means comprise an actuation member (5) and motion transmission means (10, 11), comprising a first and a second torsion bar (18, 19), capable of operatively engaging, at an end portion thereof, the actuation member (5) and, at the opposite end portion, the first and the second carriages (3, 4), respectively, The actuation member (5) is rotatably associable to the plate (2, 2a, 2b) at a section located approximately centrally relative to the first and second carriages (3, 4) and includes first effort reducing means (7, 9); the motion transmission means (10, 11) further include second effort reducing means (14, 15, 16, 17) adapted to engage the first effort reducing means (7, 9) and to be coupled to the first and second torsion bars (18, 19), respectively, so as to be integrally rotatable and freely longitudinally slidable relative to the first and second torsion bars (18, 19), respectively.

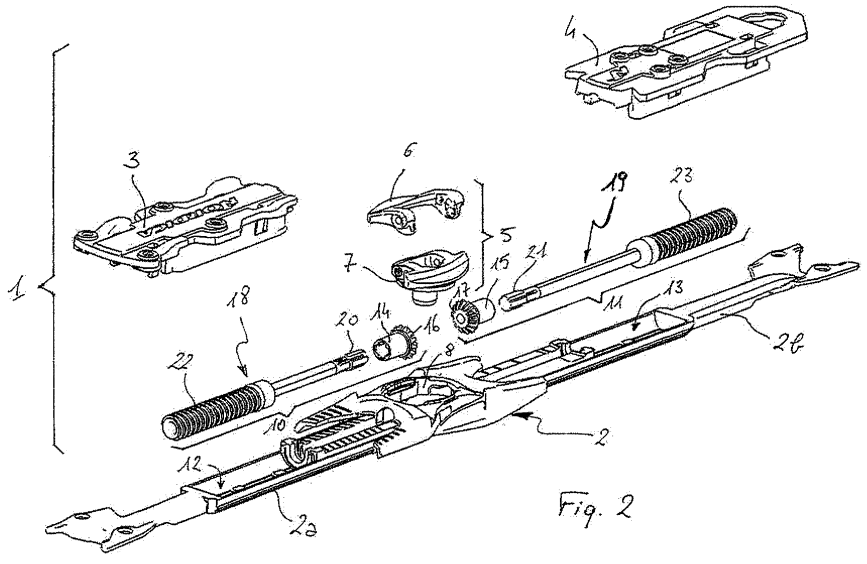

Fig. 2

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Description

[0001] The present invention refers to a device for adjusting the centre distance between the front and rear binding means of a ski binding. The adjustment provided by such device enables boots of different sizes to be fastened to a same ski binding.

[0002] Many devices are known nowadays which enable to adjust the mutual position of the binding members of a ski binding relative to the ski; more precisely such devices allow to adjust the centre distance between the front binding means, commonly referred to in the art as toe-piece and adapted to fasten the toe portion of the boot, and the rear binding means, commonly referred to in the art as heel-piece and adapted to fasten the heel portion of the boot, so as to enable ski boots of different sizes to be fitted and fastened to a ski binding in a stable and safe manner.

[0003] FR 2.151.666 and DE 2 246 668 disclose devices that allow to achieve a synchronized and simultaneous adjustment of the centre distance between the binding means through actuation means, essentially of the screw or rack type, operatively connected to motion transmission means, such as threaded bars, toothed bars or pulley systems; such motion transmission means are connected to the binding means which are slidably associated to the ski; actuating such mechanisms enables the binding means to be translatorily displaced in a synchronized and simultaneous manner along the ski in mutually opposed directions, so that adjustment to the actual size of the boot is achieved while maintaining the centre of gravity substantially unchanged.

[0004] A drawback of such known embodiments lies in the kinematical rigidity of such devices; in fact, any possible sliding movement of the heel-piece and/or the toe-piece relative to the ski, necessary in order to dynamically compensate the bending of the ski during skiing so as to keep the mutual distance of the binding means unchanged when the ski becomes bent, are practically prevented due to the rigid connection between the binding means, the motion transmission means and the actuation means of the adjusting device which substantially form a kinematic mechanism with just a single degree of freedom.

[0005] As a partial solution to the above-mentioned problem, WO 03/037452 discloses an adjusting device constituted by two mobile carriages supporting the front and rear binding means, respectively, wherein each carriage is translatorily guided along a slide that is firmly joined to the ski; each carriage is capable of being translatorily displaced along its slide by means of respective longitudinal screws which are integral in rotation and are connected to the carriages supporting the toe-piece and the heel-piece, respectively; the threads of such screws engage with a rack provided on the slide. A driving rod mutually links the two screws, which are freely sliding relative to the rod whereas the rotation thereof is made integral with the same rod.

[0006] As a result, the above-cited adjusting device enables the two carriages to be simultaneously displaced along the slides and, consequently, the heel-piece and the toe-piece to be correspondingly displaced relative to the ski, by actuating the driving rod accordingly, while anyway allowing the same heel-piece and toe-piece to dynamically slide when the ski is subject to bending thanks to the possibility for the screws to freely slide relative to the driving rod.

[0007] A drawback of this known embodiment lies in the fact that a user has to apply a considerably great effort to achieve the adjustment, since the gear ratio is practically 1:1 (one-to-one) in this case, although there is provided a small crank, connected to the rod via an articulated joint and located at the rear of the heel-piece, to rotatably drive the rod. In any case, such crank allows to obtain just a small reduction in the applicable effort due to the quite small dimensions of the lever arm of such crank required by the need to prevent any interference with the surface of the ski. Therefore, the pitch of the screws must be small to keep the effort that a user has to apply within acceptable limits and in order to avoid any use of special tools, such as screwdrivers or the like, to carry out the adjustment; as a result, the adjusting operation turns out to be time-consuming and laborious, since the user has to cause the rod to rotate (or turn the crank) a great number of times to achieve any sensible translatory displacement of the heel-piece and the toe-piece along the ski.

[0008] In addition, the driving rod of the an adjusting device as afore-described is liable to become stuck owing to both the longitudinal extent of the same rod, in particular the extension between the operating point at which the rotary movement is imparted to the rod and the transmission point at which the rotary movement is converted into a translatory movement and the latter is transmitted further on, and the degree of the effort that needs to be applied.

[0009] A further disadvantage of this prior-art embodiment lies in the poor prehensility of the actuation means for rotating the rod, due both to the dimensional constraints imposed for the afore-explained reasons and the position in which they are located, which renders the actuation means rather difficult to grasp.

[0010] The above-cited drawbacks lead generally to a poor efficiency and reliability in practical operation, further to a considerable difficulty to actuate such known adjusting devices; such difficulty is felt to a much greater extent by ski and boot hiring services, wherein such adjustment of the centre distance between the binding means to adapt the ski binding to boots of different sizes is performed quite frequently.

[0011] It is therefore a main object of the present invention to solve the above-noted problems of prior-art embodiments by providing a device for adjusting the centre distance between the binding means of a ski binding in a synchronized and simultaneous manner which is easy and convenient to operate and, at the same time,

allows the ski to freely bend under dynamic skiing conditions.

[0012] Within such general object as stated above, it is a purpose of the present invention to provide a device for adjusting the centre distance between the binding means of a ski binding capable of being conveniently operated by the user under application of a relatively small effort.

[0013] Another purpose of the present invention is to ensure that such adjustment can be operated without any need of using special tools.

[0014] A further purpose of the present invention is to ensure that such adjustment can be achieved through a reasonably limited number of actuations and, hence, a greater extent of displacement to be obtained for a same number of actuations.

[0015] Yet another purpose of the present invention is to provide a device wherein the actuation mechanism is conveniently and easily accessible and easy to grasp by the user.

[0016] A further purpose of the present invention is to provide a device which can be manufactured at competitive costs using readily available tools, machinery and equipment.

[0017] According to the present invention, these aims and advantages, along with further ones that will become apparent from the following disclosure, are reached by a device for adjusting the centre distance between the binding means of a ski binding as defined in claim 1.

[0018] Further features of the device according to the present invention are defined in the dependent claims.

[0019] Features and advantages of the present invention will anyway be more readily understood from the description of a particular, although not sole embodiment that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a perspective top view of a device for adjusting the centre distance between the binding means of a ski binding according to the present invention;
- Figure 2 is an exploded view of the device shown in Figure 1;
- Figure 3 is a perspective top view of some component parts of the adjusting device shown in Figures 1 and 2;
- Figure 4 is an exploded view of the component parts shown in Figure 3;
- Figure 5 is a bottom view of a detail of the component parts shown in Figures 3 and 4;
- Figure 6 is a bottom view of a detail of the device shown in Figure 1.

[0020] Referring to the above-cited Figures, an assembly of a device for adjusting the centre distance between the binding means of a ski binding according to the present invention, as applicable to an underlying ski (not shown), is generally indicated by the reference number 1.

[0021] The adjusting device 1 is supported onto the ski by a plate 2 connected to the ski, preferably in a slidable manner at an end portion and in a fixed manner at the opposite end portion thereof; the plate 2 may also be formed of a first element 2a and a second element 2b crossing each other, each such element having an end portion thereof that is attached in a firmly joined manner to the ski, and the opposite end portion thereof that is free to slide relative to the same ski and the other element, as described in EP 0 719 166. For reasons of conciseness, the simple wording "plate 2" will be used hereinafter as a reference aimed at defining both a plate formed of a single element and a plate formed of a first and second elements crossing each other or connected to each other in any other way.

[0022] The plate 2 extends along a longitudinal axis substantially parallel to the longitudinal extension of the ski.

[0023] The adjusting device 1 comprises a first carriage 3 and a second carriage 4, which are slidably associable to the plate 2, and on which there can be secured respective binding means for a ski boot, such as a toe-piece and a heel-piece, which are not shown in the accompanying drawings since largely known in the art.

[0024] Furthermore, means for linking the two carriages 3 and 4 together and capable to cause the two carriages 3 and 4 to synchronously and simultaneously slide in mutually opposed directions along the longitudinal axis of the plate 2 are provided. These linking means comprise:

- an actuation member 5 that is rotatably associable to the plate 2 at a section located approximately centrally relative to the two carriages 3 and 4; the actuation member 5 includes a crank 6 connected by means of an articulated joint to a body 7 that is rotatably housed in an appropriate first housing 8 provided in the plate 2; this body 7 comprises first effort reducing means, which may for example be constituted by a ring bevel gear 9;
- motion transmission means 10, 11 housed in a second and a third housing 12, 13, respectively, provided in the plate 2, which include second effort reducing means comprising a first and a second roller 14, 15 provided with a respective pinion 16, 17 adapted to engage with the ring bevel gear 9 of the body 7 from diametrically opposed sides so as to form a mechanical system of bevel gear pairs that are effective in reducing the effort that a user has to apply in order to perform an adjusting operation; the rollers 14, 15 have an internally hollow portion 25 having a polygonal cross-sectional shape or a splined con-

tour;

- a first and a second torsion bar 18, 19, each of which comprises a terminal head 20, 21 having a polygonal cross-sectional shape or a splined contour and, at the opposite end, a worm-like threaded portion 22, 23; the first and second rollers 14, 15 are adapted to operatively couple with the first and second torsion bars 18, 19 at the respective terminal heads 20, 21 thereof, so that the respective polygonal cross-sections or splined contours are able to engage the corresponding complementarily shaped hollow portions 25 of the rollers 14, 15; hence, such coupling allows the rollers 14, 15 to integrally rotate with the respective torsion bars 18, 19 and, at the same time, enables the rollers 14, 15 to freely slide along the same bars 18, 19.

[0025] The worm-like threaded portions 22, 23 are adapted to engage with corresponding nut-screw portions 24 formed under the bottom of the carriages 3 and 4, as illustrated in Figure 6, which is a bottom view of one of said two carriages, for instance carriage 3, in which the nut-screw portion 24 is shown engaging with the threaded portion 22 at the end of the torsion bar 18.

[0026] The way in which the adjusting device according to the present invention works is as follows: when an adjustment of the centre distance between the binding means of a ski binding is required, in order to adapt the ski binding to fit to the actual size of the boot to be attached thereto, the user has to extend the crank 6 from a resting position thereof, in which it lies against the body 7, into an operational position, in which it extends substantially perpendicular to the body 7, by rotating the crank 6 relative to the body 7 as indicated by the arrow A in Figures 1 and 3; once the crank 6 is brought into the operational position, the user can rotate it about an axis extending perpendicularly to the longitudinal axis of the plate 2 (and of the ski itself); such rotary motion is transmitted - via the first reducing means engaging with the second reducing means and, hence, via the ring bevel gear 9 engaging with the pinions 16, 17 of the rollers 14, 15 - to the torsion bars 18, 19 along opposite directions of rotation, thereby causing the corresponding threaded portions 22, 23 to rotate accordingly; due to such threaded portions engaging with the corresponding nut-screw portions 24 provided in the carriages 3 and 4, the rotary motion of the torsion bars 18, 19 is converted into a translatory motion of the carriages 3, 4, which therefore are caused to slide longitudinally in mutually opposite directions relative to the plate 2 and, hence, to the ski.

[0027] In addition, the dynamic behaviour during skiing of the adjusting device according to the present invention is such as to allow the ski to freely bend, since the connection of the adjusting device with the binding means, i.e. the toe-piece and the heel-piece, is not rigidly constrained: in fact, the rollers 14, 15, which are rotatably integral with the torsion bars 18, 19 to transmit the adjustment movement as described above thanks to the coupling by polygonal cross-sectional shapes or splined contours, are capable to freely slide relative to said torsion bars while keeping the engagement with the ring bevel gear 9, so as to allow the carriages 3 and 4 carrying the binding means to dynamically slide relative to the ski integrally with the plate 2, such that any bending of the ski is dynamically compensated and the distance between the binding means is kept unchanged.

[0028] Fully apparent from the above description is therefore the ability of the device for adjusting the centre distance between the binding means of a ski binding according to the present invention to reach the afore-stated aims and advantages by in fact providing a device enabling the binding means to be adjusted for the desired centre distance in a synchronized and simultaneous manner wherein the actuation by a user is extremely easy and convenient, since it can be done by applying a reasonably limited effort and without any need to use specific tools, thanks to the provision of effort reducing means, which, in the afore-described embodiment, are provided in the form of a bevel gear pair formed by the ring bevel gear 9 of the body 7 and the pinions 16 and 17 of the rollers 14 and 15.

[0029] In addition, the central position of the actuation member 5, and in particular the easy and convenient prehensility of the crank 6, makes the adjusting device extremely easy and convenient to be reached and operated by a user.

[0030] A further advantage derives from the fact that, owing to the afore-mentioned provision of effort reducing means, a large screw pitch can be used for the threads of the threaded portions 22, 23 and the nut screw 24, instead of a fine pitch as used in prior-art embodiments, thereby enabling the centre distance to be adjusted through a reasonably limited number of rotations of the crank 6 due to the greater extent of the mutual displacement of the carriages 3 and 4 achieved through a same number of rotations of the crank 6.

[0031] Moreover, the relatively small longitudinal extent of the torsion bars 18, 19 and the smaller amount of effort to be applied during the adjustment operation allow to reduce to a considerable extent, if not wholly prevent, the risk for the transmission means 10, 11 to become stuck, thereby further increasing the reliability of the device and the convenience in using it.

[0032] It should also be specially noticed that the adjusting device according to the present invention - further to the above-noted advantages - has the added benefit of allowing the ski to freely bend under dynamical conditions when skiing, thanks to the rollers 14, 15 being slidably coupled to the respective torsion bars 18, 19, thereby allowing the carriages 3 and 4 to dynamically slide, integrally with the plate 2, relative to the ski.

[0033] It will anyhow be appreciated that the device according to the present invention, so as described and illustrated above, may be subject to a number of modifications, directed at a number of different applications,

and be embodied in a number of different manners without departing from the scope of the present invention as defined in claim 1.

[0034] Furthermore, the materials, the shapes and the sizing of the device according to the present invention may be selected so as to more appropriately fit the particular applications and requirements.

Claims

1. Device for adjusting the centre distance between the binding means of a ski binding, comprising:

- a first carriage (3) and a second carriage (4) slidably associable to a plate (2, 2a, 2b), said plate (2, 2a, 2b) being associable to a ski and extending along a longitudinal axis essentially parallel to the longitudinal extension of the ski, said first carriage (3) and said second carriage (4) being adapted to support respective binding means for a ski boot;
- linking means for mutually linking said first carriage (3) and said second carriage (4), said linking means being capable to cause a simultaneous and synchronous sliding motion of said first carriage (3) and said second carriage (4) along said longitudinal axis of said plate (2, 2a, 2b) in mutually opposed directions, said linking means comprising:
- an actuation member (5); and
- motion transmission means (10, 11) capable of operatively engaging, at an end portion thereof, said actuation member (5) and, at an opposite end portion, said first carriage (3) and, respectively, said second carriage (4), said motion transmission means (10, 11) comprising a first torsion bar (18) and a second torsion bar (19),

characterized in that:

- said actuation member (5) is rotatably associable to said plate (2, 2a, 2b) at a section located approximately centrally relative to said first carriage (3) and said second carriage (4), said actuation member (5) including first effort reducing means (7, 9);
- said motion transmission means (10, 11) further including second effort reducing means (14, 15, 16, 17) adapted to engage said first effort reducing means (7, 9) and to be coupled to said first torsion bar (18) and said second torsion bar (19), respectively, so as to be integrally rotatable and freely longitudinally slidable relative to said first torsion bar (18) and said second torsion bar (19), respectively.

2. Device according to claim 1, wherein said motion transmission means (10, 11) comprise threaded portions (22, 23) integral with respective end portions of said first torsion bar (18) and second torsion bar (19) and adapted to engage with respective nut-screw portions (24) provided on said first carriage (3) and said second carriage (4).

3. Device according to claim 1, wherein said actuation means (5) comprise a crank (6) connected by means of an articulated joint to a body (7), said crank (6) being movable from a resting position, wherein said crank (6) lies adjacent said body (7), to an operational position, wherein said crank (6) extends substantially perpendicular to said body (7).

4. Device according to claim 3, wherein said body (7) is rotatably housed in a first housing (8) provided in said plate (2, 2a, 2b) and comprises said first effort reducing means (9).

5. Device according to claim 1 or 4, wherein said first effort reducing means are constituted by a ring bevel gear (9).

6. Device according to claim 1, wherein said second effort reducing means comprise a first roller (14) and a second roller (15) provided with a respective pinion (16, 17).

7. Device according to claim 6, wherein each of said pinions (16, 17) is adapted to engage with said ring bevel gear (9) from diametrically opposed sides so as to form respective bevel gear pairs rotating in mutually opposed directions of rotation.

8. Device according to claim 6 or 7, wherein each of said rollers (14, 15) has an internally hollow portion (25) having a polygonal cross-sectional shape or a splined contour.

9. Device according to claims 1 and 2, wherein each said first torsion bar (18) and second torsion bar (19) comprises, at the side opposite said threaded portions (22, 23), a terminal head (20, 21) having a polygonal cross-sectional shape or a splined contour.

10. Device according to claims 8 and 9, wherein said first roller (14) and said second roller (15) are adapted to operatively couple with said first torsion bar (18) and said second torsion bar (19) at said respective terminal heads (20, 21) such that said polygonal cross-sectional shapes or said splined contours of said terminal heads (20, 21) are able to engage the corresponding complementarily shaped hollow portions (25) of said rollers (14, 15).

11. Ski binding comprising a device for adjusting the centre distance between the binding means according

to claim 1.

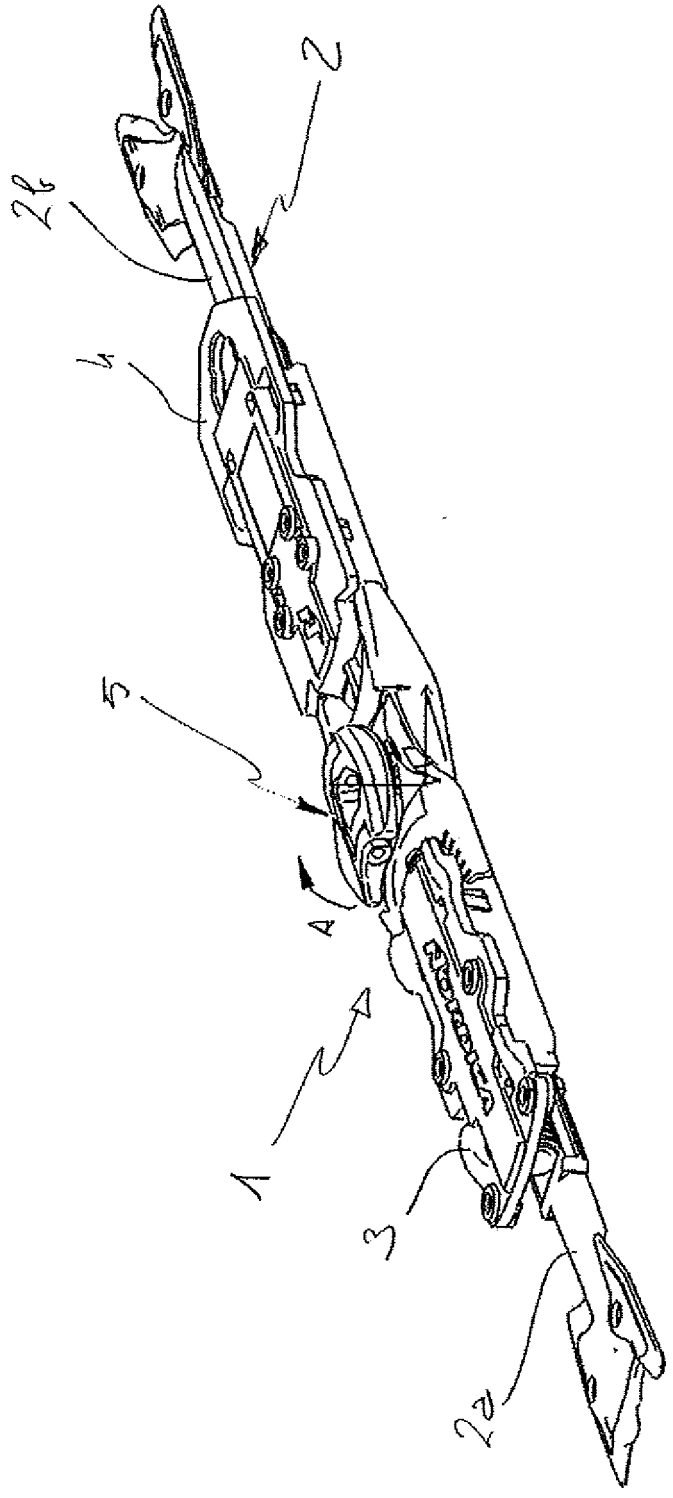

Fig. 1

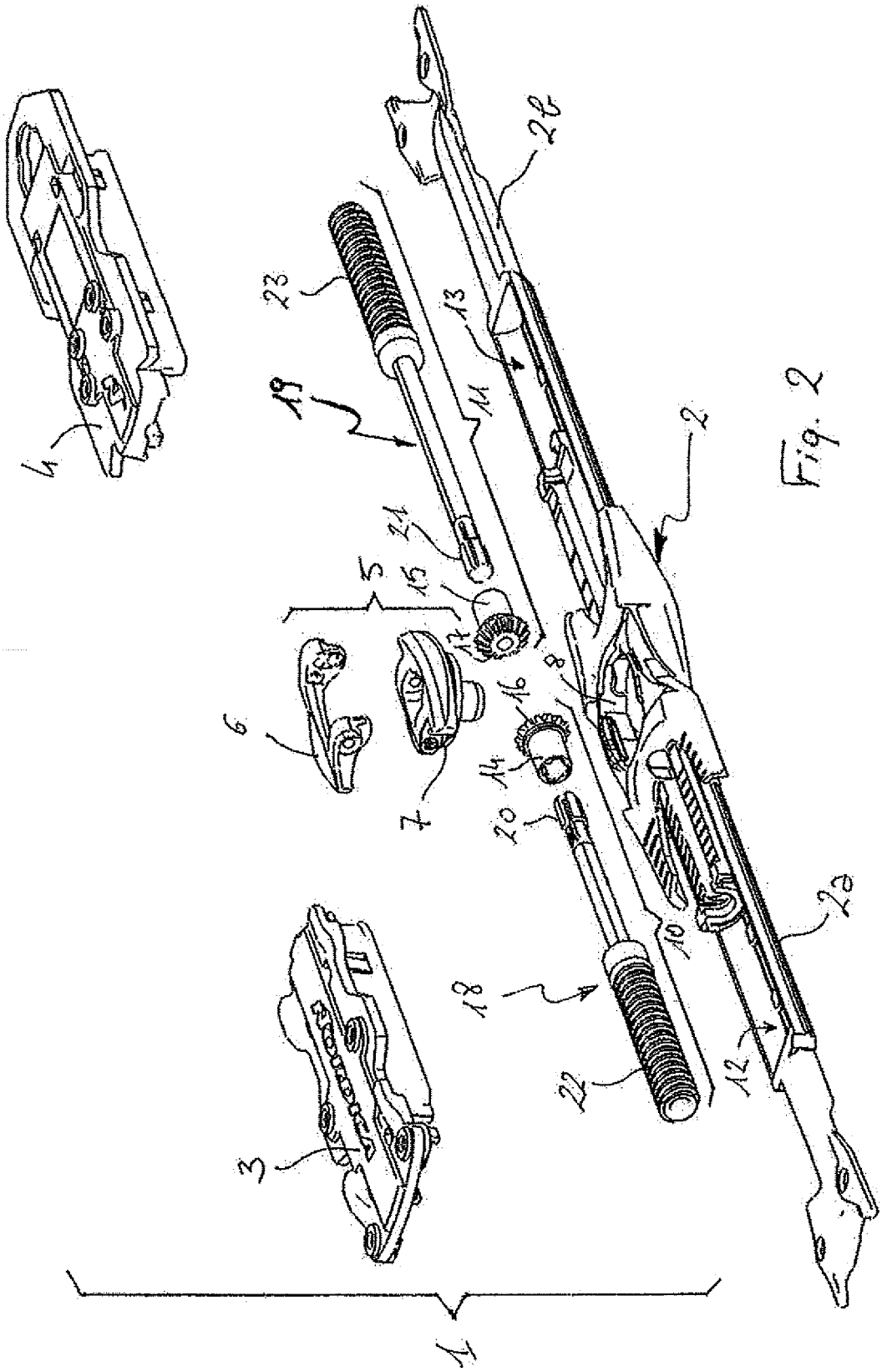

Fig. 2

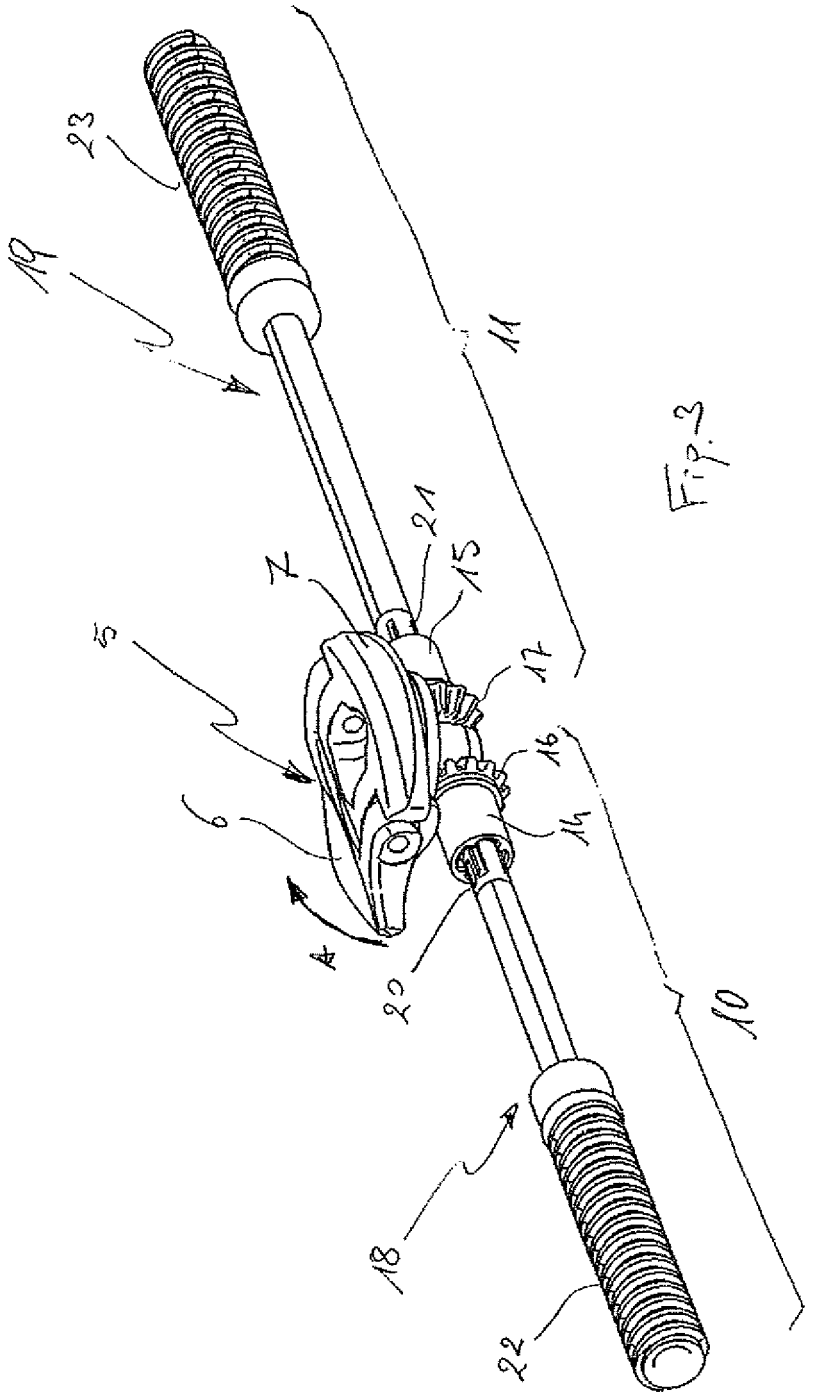

Fig. 2

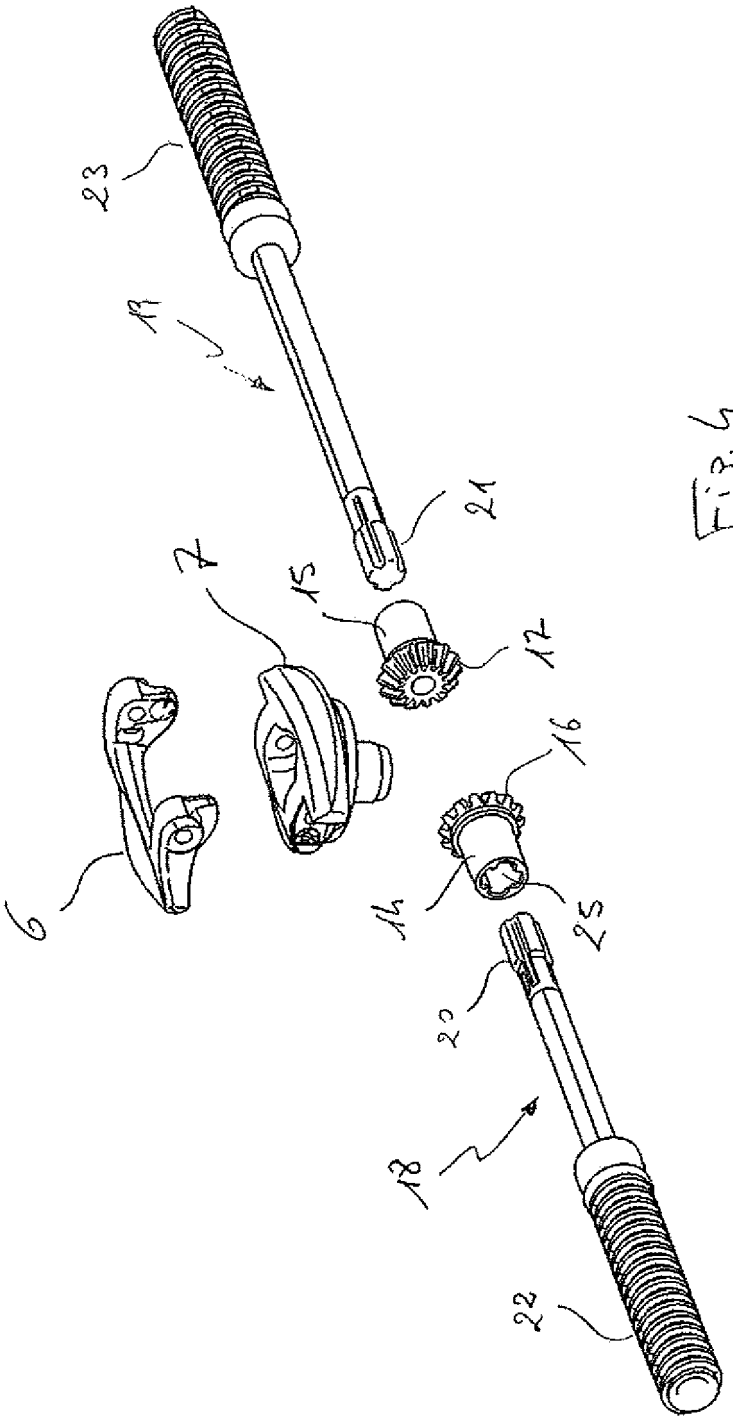

Fig. 4

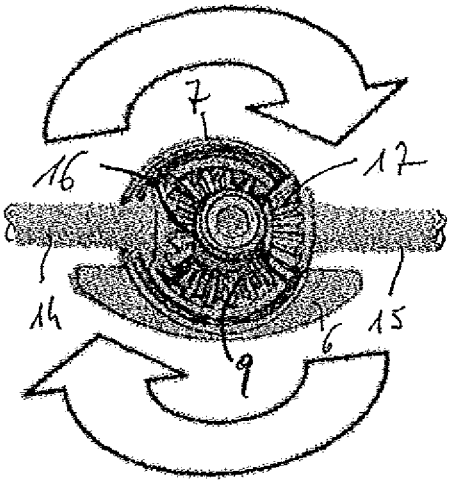

Fig. 5

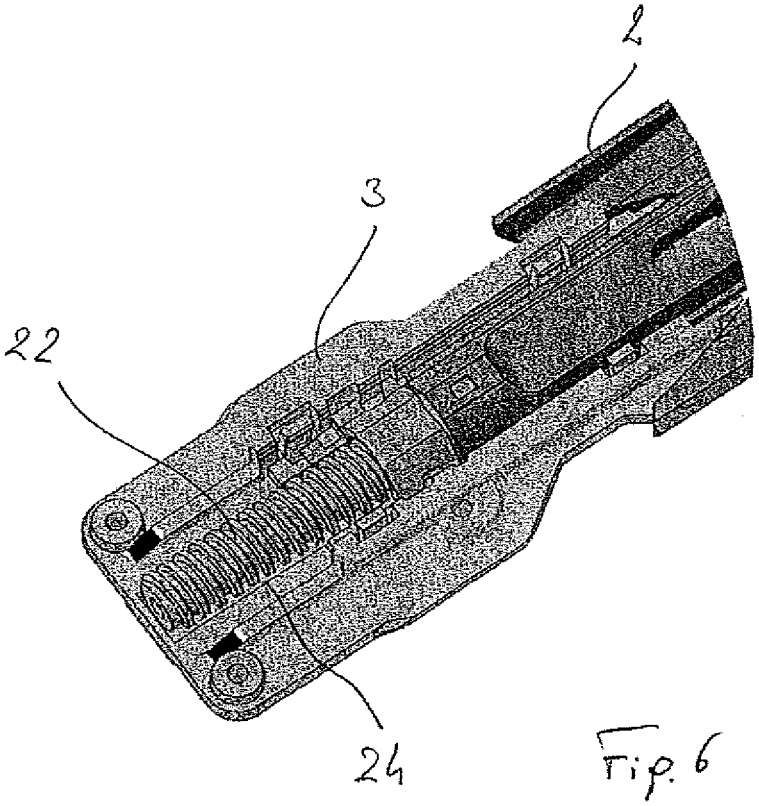

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 09 15 0349

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 May 2009	Haller, E

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