TURNING FASTENER FOR A SHOE

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ABSTRACT

A turning fastener for a shoe has a pulling means with two end portions, which act on a take-up reel, which is provided with an annular groove for receiving the pulling means, a rotatable mounting of the take-up reel with a bearing journal, which engages in a bearing, a holder, which can be fastened to the shoe, for the rotatable mounting, and an engageable and disengageable directional locking mechanism, which in the engaged position blocks the take-up reel in one direction of rotation for closing the shoe and in the disengaged position releases it in this direction of rotation. The take-up reel is formed as a rotary grip, wherein two through-openings, extending from the annular groove to the end face of the take-up reel that is facing away from the holder, are provided for leading one or the other end portion of the pulling means through. The take-up reel is guided in an axially displaceable manner with the bearing journal and the bearing, and the directional locking mechanism is engaged in the position of the take-up reel in which it is pushed towards the holder and is disengaged in the position in which it is pushed away from the holder.
TURNING FASTENER FOR A SHOE

[0001] The invention relates to a turning fastener for a shoe—according to the preamble of claim 1.

[0002] Such a turning fastener is known from DE 295 03 552 U1. There the bearing journal, which engages in a bearing bore in a holding plate mounted at the shoe tongue, is disposed at a drive axis, which is provided with a turning handle. On the drive axis is rotatably disposed the wind-up spool and nonrotatably disposed a gear disk, which together with an eccentric disc forms a reduction gear. The directional ratchet mechanism is formed by a detent spring, which engages in the teeth of the gear disk. For the first quick closure process there is provided a sliding clutch between the turning handle and the wind-up spool. During the following powerful tensioning process the reduction gear is activated. In order to open the fastener, the detent spring is pulled out of the toothing with a disengaging device.

[0003] From DE 295 03 552 U1 is known a turning fastener, with which the wind-up spool is activated via a planetary gear train with a drive axis at a turning handle, wherein for opening the fastener there is provided a clutch element between drive axis and planetary gear train that can be disengaged by an axial pressure actuation. For fastening the pulling means in the hub of the wind-up spool are provided two through bores, through which the two ends of the pulling means are passed.

[0004] In the turning fastener according to U.S. Pat. No. 6,289,558 B1 between a turning handle axially displacably mounted at a housing and a drive axis, which actuates the wind-up spool via a toothed-wheel reduction gear, is provided a toothed wheel as a clutch, which is released when the turning handle is drawn away, as a result of which the wind-up spool is released for opening the fastener. The tensioning position is locked by a pawl ratchet mechanism between turning handle and housing. The two ends of the pulling means are fastened with setscrews in radial bores of the wind-up spool. In order to be able to wind up even a greater length of the pulling means onto the spool, such as is the case with boots with a high leg, as a pulling means a thin steel cable is used, which, however, easily kinks and breaks.

[0005] Because of their complicated structure the known turning fasteners are very costly. Although according to DE 295 03 491 U1 the closure process is shortened by the sliding clutch, with the known turning fasteners tensing the pulling means by rotating the turning handle still takes up much time, in particular when great lengths of the pulling means have to be wound up, as it is the case with boots having a high leg.

[0006] It is the problem of the invention to provide a simply structured turning fastener, with which the closure process can be quickly carried out.

[0007] This is achieved according to the invention with the turning fastener characterized in claim 1. Advantageous embodiments of the invention are represented in the subclaims.

[0008] The turning fastener according to the invention substantially consists of the wind-up spool, a bearing journal and a bearing for the bearing journal for rotatably mounting the wind-up spool, a support at the shoe for the rotatable mounting and a directional ratchet mechanism. Thus it is characterized by a very simple structure. In contrast to the known turning fasteners the turning fastener according to the invention thus in particular has no additional turning handle, no separate reduction gear and no housing.

[0009] The directional ratchet mechanism is preferably formed by a pawl ratchet mechanism, the pawls are provided at the wind-up spool or the support and the recesses, in which the pawls engage, are provided at the support or the wind-up spool. I.e. the pawls can be provided at the support and the recesses at the spool, or the spool can have the pawls and the support the recesses.

[0010] Here the pawls are preferably formed by elastic tongues, which can be integrally formed with the wind-up spool or the support. Furthermore, the bearing journal can be integrally formed with the support or the wind-up spool and the bearing can be integrally formed with the wind-up spool or the support. The pawls or pawl tongues are disposed on a circle coaxially to the bearing journal and are regularly distributed over the circumference.

[0011] Instead of a pawl ratchet mechanism the directional ratchet mechanism can also be formed by a different ratchet mechanism, which in the engaged state is rotatable in only one direction, e.g. a toothed-wheel ratchet mechanism or friction ratchet mechanism.

[0012] With that the turning fastener according to the invention in the simplest case can be formed of merely two parts, for example two injection moulded plastic parts. This means that the turning fastener according to the invention can be manufactured very cost-effectively.

[0013] Moreover, the closure process can be carried out very quick with the turning fastener according to the invention.

[0014] When the shoe is in the open position and the pulling means is totally slackened, as it is the case when on opening the shoe the tongue was moved out very far, the pulling means is pulled with the hand out through the two through openings in the wind-up spool until the tensile force noticeably increases. At the same time the wind-up spool is pushed against the support, so that the directional ratchet mechanism is engaged, i.e. the wind-up spool blocks in one rotation direction for closing the shoe, whereupon the wind-up spool formed as a turning handle is rotated with the hand, in order to wind up the pulling means with large tensile force onto the wind-up spool and to tense the pulling means, until the shoe fits correct.

[0015] Since in particular with shoes having a leg, such as snowboard boots, the greatest part of the pulling means is pulled out merely through the two through openings in the wind-up shaft, in the actual closure process only a short pulling means portion needs to be wound up by turning the wind-up spool.

[0016] With that the closure process can be effected very quick. Moreover, the turning fastener according to the invention can be opened in a fraction of a second, since the wind-up spool merely has to be slightly drawn away, so that the directional ratchet mechanism is released, i.e. disengaged.

[0017] The bearing journal can be provided at the wind-up spool and optionally can be integrally formed with it. Then the bearing for the bearing journal can be formed by a bearing bore in the support or for example by a tube preferably integrally formed with the support. Preferably the bearing journal is disposed at the support, while the bearing is formed by an axial bore in the wind-up spool.

[0018] The through openings in the wind-up spool can be formed by bores or, for example, by circular-arc-shaped slits disposed coaxially to the rotation axis of the wind-up spool.
For engaging and disengaging the directional ratchet mechanism the wind-up spool is axially displaceable. It is axially guided by the bearing journal and the bearing.

But preferably the wind-up spool is adapted to be slipped onto the bearing journal and to be slipped off from it. With that the two end portions of the pulling means can be easily and quickly pulled through the two through openings of the wind-up spool, by merely grasping them with the hand, while the wind-up spool guided by the pulled out pulling means end portions is pushed with the other hand towards the bearing journal and is slipped onto it. For opening the shoe then the wind-up spool only needs to be slipped off the bearing journal, preferably by pulling at the two pulling means ends.

Preferably, both the bearing journal and the axial bore in the wind-up spool are formed in a conically tapered fashion. Since with that the axial bore of the wind-up spool extends in the direction of the support can be slipped onto the conically tapered end of the bearing journal in the axial bore of the wind-up spool, slipping the wind-up spool onto the bearing journal is facilitated.

For rotating, the turning handle formed according to the invention as a wind-up spool is grasped with the hand at the circumference. For this purpose it has ribs, a knurl or a similar non-slip surface at the circumference.

In order to form a gear reduction, the hub of the wind-up spool, i.e. the ring groove of the wind-up spool has a substantially smaller diameter at its groove ground than the outside diameter of the wind-up spool. Preferably, the diameter at the groove ground is at least by a third smaller, preferably, at least by the half smaller than the outside diameter of the wind-up spool.

The two through openings in the front of the wind-up spool facing away from the support preferably are disposed diametrally opposing each other, i.e. offset by 180°, and as near as possible at the groove ground of the ring groove of the wind-up spool. I.e. their radial distance from the groove ground preferably amounts maximally a third of the radial distance between groove ground and outside diameter of the wind-up spool.

Preferably, the cross section of the ring groove of the wind-up spool tapers toward the groove ground. With that, when the two through openings are diametrally opposing each other, when rotating further the turning handle, already after one revolution of the wind-up spool, i.e. when the tensile force of the pulling means acting at the wind-up spool is still relatively small, the next winding of the pulling means comes to lie on the two pulling means portions corresponding to a half revolution at the groove ground, which extend at the two through openings, as a result of which the pulling means portions are fixed at the groove ground such that when rotating further the wind-up spool a tensile force is no longer acting on the two pulling means end portions guided by the through openings and resting on the groove ground. For this purpose the groove can be formed e.g. V-shaped in cross section, or from one or from each of the two groove walls can extend a groove wall portion obliquely to the axis toward the other groove wall, in order to form a narrow groove ground. The groove ground can be linear. Preferably it is smaller than the double thickness of the pulling means.

So as to the wind-up spool, when it has been slipped off the bearing journal to open the shoe, remains fixed at the pulling means, the two pulling means portions guided by the through bores in the wind-up spool are connected to each other at their ends, for example by a knot. In the area of the end portions connected to each other there can also be provided a strap for example made of a textile material, leather or similar flexible material, so that the pulling means end portions are held with the strap.

The pulling means is preferably formed by a conventional lace or the like, in particular of plastic fibers, which preferably are braided. The thickness of such a rope formed by textile fibers can be for example 2 millimeters to 4 millimeters.

The support, with which the turning fastener is mounted at the shoe, is preferably formed by a holding plate, which for example can be incorporated into the shoe material.

The support can be mounted at the side or at the rear at the leg of the shoe, but preferably the turning fastener is mounted at the tongue of the shoe.

Preferably, the shoe has a conventional lacing. I.e. at the opposing edges of the retaining flaps, which overlap the tongue, there are provided diverters with a friction as low as possible, such as eyelets made of metal or plastic, or textile strings, so-called “lace loops”, through which the pulling means is guided, the pulling means forming an intersection point on the tongue between in each case two pairs of opposing diverters. The wind-up spool of the turning fastener preferably is disposed at the level of or above the uppermost diverter at the tongue.

This means the pulling means is guided under diverters at the shoe on both sides of the shoe tongue. When the support is mounted at the shoe tongue, it is offset to the front, i.e. towards the toe of the shoe, just as the wind-up spool, when it is in the position pushed towards the support, in which the directional ratchet mechanism is engaged. With that when the pulling means is tensed, the wind-up spool is drawn backwards against the support by the two diverters adjoining the wind-up spool on both sides of the shoe tongue, and with that the bearing journal is reliably held in the bearing and the directional ratchet mechanism is reliably held in the engaged position.

The turning fastener according to the invention is in particular suitable for shoes with leg, such as snowboard boots, skiing boots, inline-skate boots or ice-skating boots or other sport shoes with leg.

In the following the turning fastener according to the invention by way of example is explained in more detail with reference to the accompanying figure.

FIGS. 1 to 6 show in perspective view the individual steps when closing (FIGS. 1 to 5) and opening (FIG. 6) the only partially displayed shoe with a turning fastener according to a first embodiment;

FIG. 7 shows a side view of the wind-up spool of the turning fastener according to the FIGS. 1 to 6; and

FIGS. 8 and 9 show in perspective view the first two steps according to the FIGS. 1 and 2 when closing the shoe, but in the case of a different embodiment of the turning fastener.

According to FIG. 1 a shoe, of which only the leg 1 is partially displayed, has diverters 4, 5 formed as pipe bends at the edges of the two retaining flaps 2, 3, through which a pulling means 6, for example a lace, is guided, which corresponding to a conventional lacing forms intersection points 7 on the tongue 8 of the shoe, which overlap the retaining flaps 2, 3.

In the level of the uppermost diverter 4, 5 of the lacing displayed in FIG. 1 to the tongue 8 is mounted a
support 10 formed as a holding plate 9, from which a bearing journal 12 extends forward, which conically tapers.

[0039] Bearing journal 12 serves for the rotatable mounting of a wind-up spool 13. For this purpose the wind-up spool 13 has an axial bore 14, into which bearing journal 12 engages (FIGS. 3 to 6). Axial bore 14 is conically formed in the same way as bearing journal 12, i.e. it has on the front of the wind-up spool 13 facing support 10 a greater diameter than on its opposing front.

[0040] Wind-up spool 13 is formed as a non-slip turning handle by ribs 15 at the circumference. It has a circumferential ring groove 16, which takes up pulling means 6 when it is wound up.

[0041] From ring groove 16 there extend two through openings 17, 18 offset by 180° and formed by bores to the front of the wind-up spool 13 facing away from support 10, through which the two end portions 6a, 6b of pulling means 6 are guided.

[0042] Furthermore, there is provided a directional ratchet mechanism, which has the form of a pawl ratchet mechanism. The pawl ratchet mechanism is formed by pawls which have the form of elastic tongues 21 disposed at the front of the holding plate 9 facing away from tongue 8 of the shoe as well as saw-tooth shaped pawl teeth 22 disposed at the front of the wind-up spool 13 facing holding plate 9. With that the tooth spaces of the pawl teeth 22 form recesses, into which the pawl tongues 21 engage, when, as shown in FIGS. 3 to 5, the wind-up spool 13 on the bearing journal 12 is in a position pushed to holding plate 9. In this position, in which the pawl ratchet mechanism is engaged, for closing the shoe the wind-up spool 13 is rotatable only in the rotation direction corresponding to arrow A (FIGS. 3 to 5), but not in the opposing rotation direction corresponding to arrow B (FIG. 6).

[0043] According to FIGS. 1 and 2 wind-up spool 13 is adapted to be slipped onto bearing journal 12 corresponding to arrow C and according to FIG. 6 corresponding to arrow D is adapted to be slipped off bearing journal 12.

[0044] As displayed in FIG. 7, the ring groove 16 of the wind-up shaft 13 has a groove ground 23, which is formed by an inner groove wall portion 19 of the groove wall 19 facing axis 25, which extends obliquely to axis 25 to the other groove wall 20 with the two through openings, whereby in FIG. 7 only opening 17 can be seen. Between groove wall portion 19 and groove wall 20 the groove ground 23 is formed narrow, nearly linear. From FIG. 7 can also be seen, that the through opening 17 and likewise the diametral opposing in FIG. 7 not visible through opening 18 run into the groove 16 at the level of the groove ground 23. Furthermore, from the drawing also appears, that the two end portions 6a, 6b of the pulling means 6 guided by the through openings 17, 18 at their ends in the area at which they are connected to each other are provided with a strap 24.

[0045] Holding plate 9, pawl tongues 21 and bearing journal 12 are integrally formed, for example as an injection-moulded plastic part. The wind-up spool 13 together with the pawl teeth 22 can form one single injection-moulded plastic part.

[0046] The turning fastener according to the invention functions as follows.

[0047] When the shoe is in the open position according to FIG. 1 and the pulling means 6 formed e.g. by a lace is slackened, as it is the case when opening the shoe the tongue 8 has been moved out, the strap 24 at the end portions 6a, 6b of the pulling means 6 is grasped with one hand and the two end portions 6a, 6b are tensed corresponding to arrow K (FIGS. 1 and 2). With the other hand the wind-up spool 13 is grasped and pushed according to arrow C toward the bearing journal 12 (FIGS. 1 and 2), slipped onto it and then the pulling means end portions 6a, 6b are pulled out of the openings 17, 18 with the strap 24 until the tensile force noticeably increases (FIG. 3). With that the pawl ratchet mechanism is engaged, i.e. the tongues 21 at the holding plate 9 engage into the teeth 22 at the wind-up spool 13, so that wind-up spool 13 can only be rotated clockwise, i.e. in the rotation direction according to arrow A. When the wind-up spool 13 starting out from the position in FIG. 3 is rotated further by more than a half revolution according to the arrow A, i.e. e.g. 270° in the position according to FIG. 4, on the pulling means portions extending through the two through openings 17, 18 into the groove on the groove ground 23 comes to lie the next winding of the pulling means 6, as a result of which, since this winding is pulled from the diverters 4, 5 onto the wind-up spool 13 with a greater tensile stress, the pulling means portions on the groove ground 23 are clamped such, that when rotating further the wind-up spool 13 a tensile force is no longer applied onto the two end portions 6a, 6b of the pulling means guided through the openings 17, 18.

[0048] By rotating further the wind-up spool according to FIG. 5, by the gear reduction, which results from the ratio F:E, i.e. groove ground diameter against outside diameter of the turning handle, pulling means 6 can be wound with great tensile force onto wind-up shaft 13 and with that the shoe can be laced until it fits well.

[0049] Since the two diverters 4, 5 adjoining the spool 13 in relation to the spool 13 are offset to the back, the spool 13 at the same time is pulled against the support 10 and with that reliably held on the bearing journal 12 by the tensed pulling means 6.

[0050] For opening the laced shoe the wind-up spool 13 according to FIG. 6 located on the bearing journal 12 is slightly slipped off the holding plate 9 according to arrow D, as a result of which the pawl ratchet mechanism is disengaged, i.e. the pawl tongues 21 and the teeth 22 are brought out of engagement. With that the wind-up spool 13 can rotate back in the direction of arrow B, so that the shoe can be opened. Besides, pulling away the wind-up spool 13 is preferably effected by tightening the end portions 6a, 6b of the pulling means with the strap 24. With that at the same time the pulling means 6 is wound off the spool 13 and the spool 13 is rotated back into the starting position displayed in the FIGS. 1 and 2.

[0051] The embodiment according to FIGS. 8 and 9 differs from the one according to FIGS. 1 to 7 substantially only in that the pawl ratchet mechanism is provided by a circular set of inwardly directed teeth 26 of the wind-up spool 13 and the pawl tongues 27 are provided at the circumference of a protrusion 27 at the holding plate 9.

1. Turning fastener for a shoe with a pulling means (6) with two end portions (6a, 6b), which act at a wind-up spool (13), which is provided with a ring groove (16) for receiving the pulling means (6), a rotatable mounting of the wind-up spool (13) with a bearing journal (12), which engages in a bearing, a support (10) mountable at the shoe for the rotatable mounting, and an engageable and disengageable directional ratchet mechanism, which for fastening the shoe in an engaged position blocks the wind-up spool (13) in a rotation direction (B) and in the disengaged position releases it in this rotation direction (B), characterized in that the wind-up spool (13) is
formed as a turning handle, two through openings (17, 18) are provided which extend from the ring groove (16) to the front of the wind-up spool (13) facing away from the support (10) for guiding through the one or the other end portion (6a, 6b) of the pulling means (6), the wind-up spool (13) with the bearing journal (12) and the bearing is guided axially displaceable and when the wind-up spool (13) is in the position pushed to the support (10) the directional ratchet mechanism is engaged and in the position pushed away from the support (10) it is disengaged.

2. Turning fastener according to claim 1, characterized in that the bearing journal (12) is disposed at the support (10) and the bearing is formed by an axial bore (14) of the wind-up spool (13).

3. Turning fastener according to claim 2, characterized in that the wind-up spool (13) is formed such that it can be slipped onto the bearing journal (12) and that it can be slipped off it.

4. Turning fastener according to claim 2, characterized in that the bearing journal (12) and the axial bore (14) of the wind-up spool (13) taper towards their end facing away from the support (10).

5. Turning fastener according to claim 1, characterized in that the ring groove (16) of the wind-up spool (13) at its groove ground (23) has a diameter (Ф), which is at least by a third smaller than the outside diameter (B) of the wind-up spool (13).

6. Turning fastener according to claim 1, characterized in that the cross section of the ring groove (16) of the wind-up spool (13) tapers to the groove ground (23).

7. Turning fastener according to claim 1, characterized in that the two through openings (17, 18) are disposed diametally opposing each other.

8. Turning fastener according to claim 1, characterized in that the two through openings (17, 18) extend to the groove ground (23) of the ring groove (16).

9. Turning fastener according to claim 1, characterized in that the two pulling means end portions (6a, 6b) guided by the through openings (17, 18) in the wind-up spool (13) are connected to each other at their ends.

10. Turning fastener according to claim 1, characterized in that the directional ratchet mechanism is formed by a pawl ratchet mechanism with at least one pawl.

11. Turning fastener according to claim 10, characterized in that the at least one pawl is provided at the wind-up spool (13) or the support (10) and the recesses, in which the pawl engages, are provided at the support (10) or the wind-up spool (13).

12. Turning fastener according to claim 11, characterized in that the recesses are formed by a pawl toothing (22, 25).

13. Turning fastener according to claim 10, characterized in that the pawl is formed by an elastic tongue (21, 27).

14. Turning fastener according to claim 11, characterized in that the recesses and/or the tongue (21, 27) are integrally formed with the wind-up spool (13) or the support (10).

15. Turning fastener according to claim 1, characterized in that the bearing journal (12) is integrally formed with the support (10) or the wind-up spool (13).

16. Turning fastener according to claim 1, characterized in that the support (10) is formed by a holding plate (9) mountable at the shoe.

17. Turning fastener according to claim 1, characterized in that the pulling means (6) is formed by a lace.

18. Turning fastener according to claim 1, characterized in that the support (10) is mounted at the shoe tongue (8).

19. Turning fastener according to claim 18, characterized in that the pulling means (6) is guided on the two sides of the shoe tongue (8) via diverters (4, 5) at the shoe (1) and the wind-up spool (13), when pushed to the support (10) in the engaged position, in relation to the two adjoining diverters (4, 5) on both sides of the shoe tongue (8) is disposed offset to the front, so that when the pulling means (6) is tensed the wind-up spool (13) is pulled against the support (10).

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