



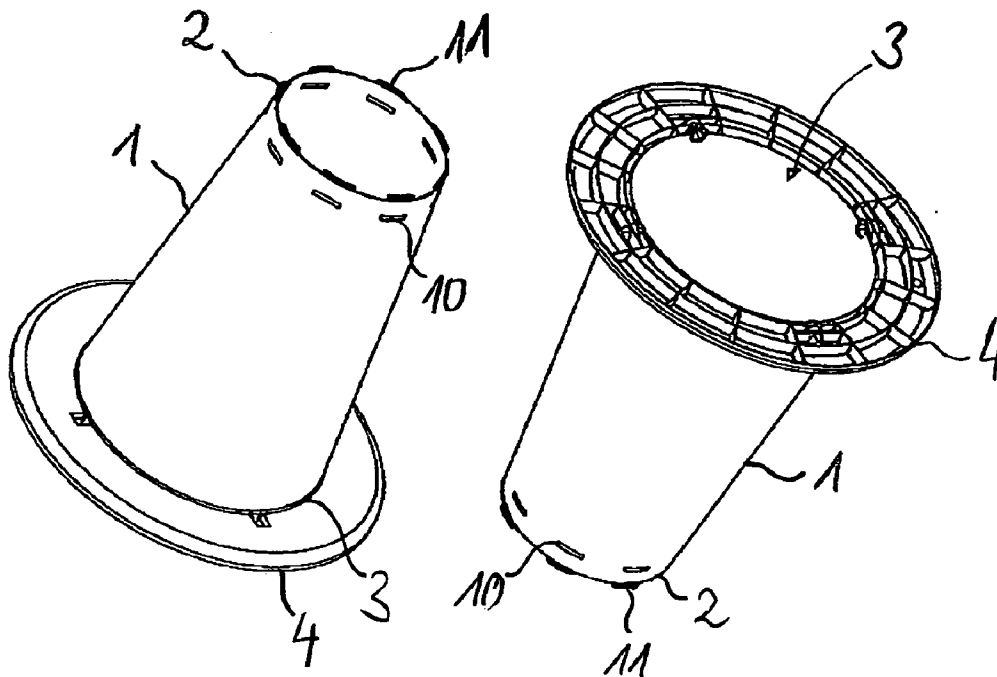
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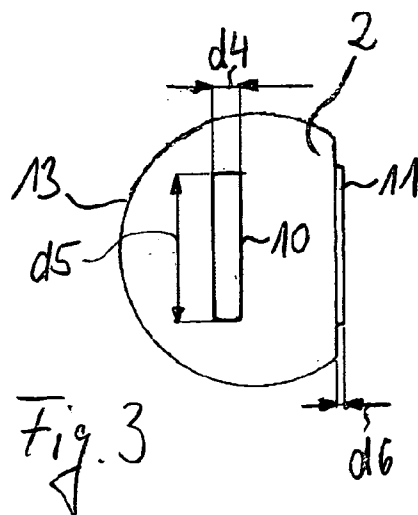
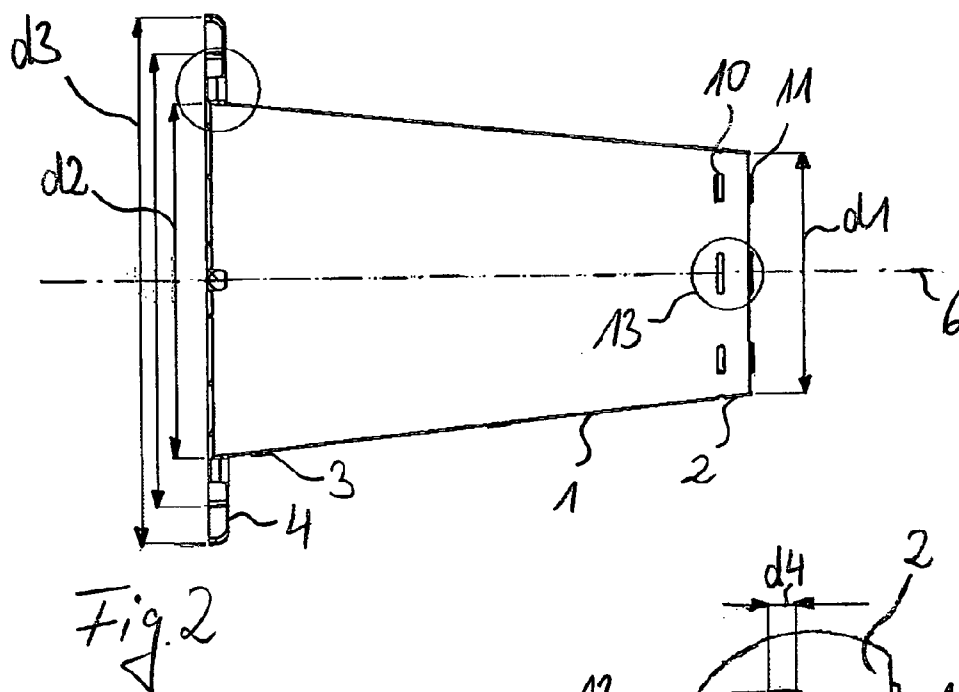
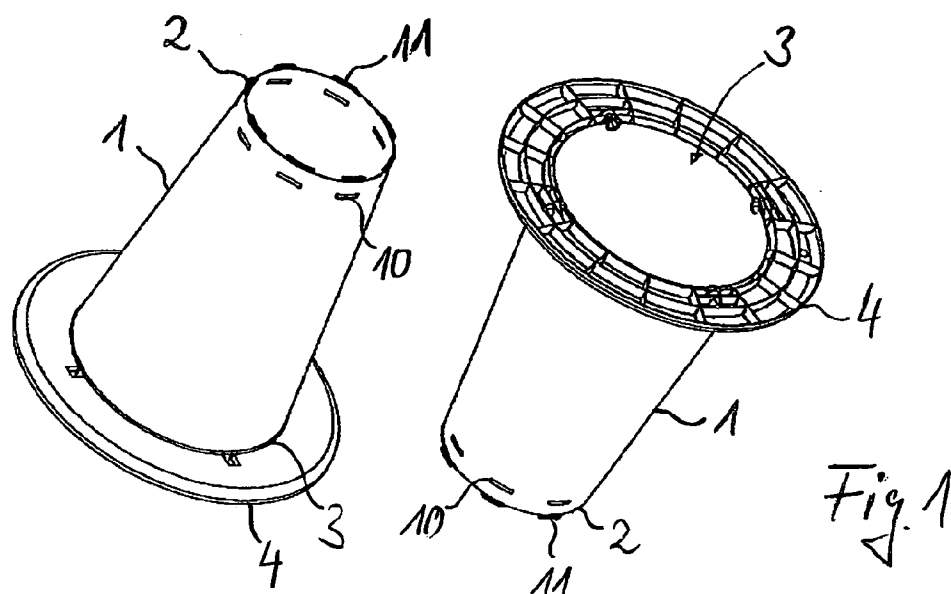
(19) **United States**(12) **Patent Application Publication**  
**Troitzsch et al.**(10) **Pub. No.: US 2014/0312159 A1**(43) **Pub. Date: Oct. 23, 2014**(54) **SPOOL FOR RECEIVING WINDING  
MATERIAL AND SPOOL PART SYSTEM**(75) Inventors: **Steffen Troitzsch**, Wolkersdorf (DE);  
**Rainer Vockentanz**, Schwabach (DE)(73) Assignee: **Maschinenfabrik Niehoff GmbH &  
Co.KG**, Schwabach (DE)(21) Appl. No.: **13/980,473**(22) PCT Filed: **Jan. 19, 2012**(86) PCT No.: **PCT/EP12/00246**§ 371 (c)(1),  
(2), (4) Date: **Sep. 30, 2013**(30) **Foreign Application Priority Data**

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**B65H 54/10** (2006.01)(52) **U.S. Cl.**CPC ..... **B65H 54/103** (2013.01)USPC ..... **242/608.2**(57) **ABSTRACT**

A spool is provided for receiving winding material, having a rotationally symmetrical, in particular conical, spool core for receiving the winding material, wherein the spool core has a first end and one or more first latch areas, and a first flange comprising one or more first latch elements. In order to enable the first flange to be mounted on the spool core as reliably as possible and with a simplified construction, one or more second latch areas are provided on the first end of the spool core and one or more second latch elements are provided on the first flange, wherein the second latch areas are formed on the spool core and the second latch elements are formed on the first flange, such that the second latch elements engage with the corresponding second catch areas when the first catch elements are engaged with corresponding first latch areas.





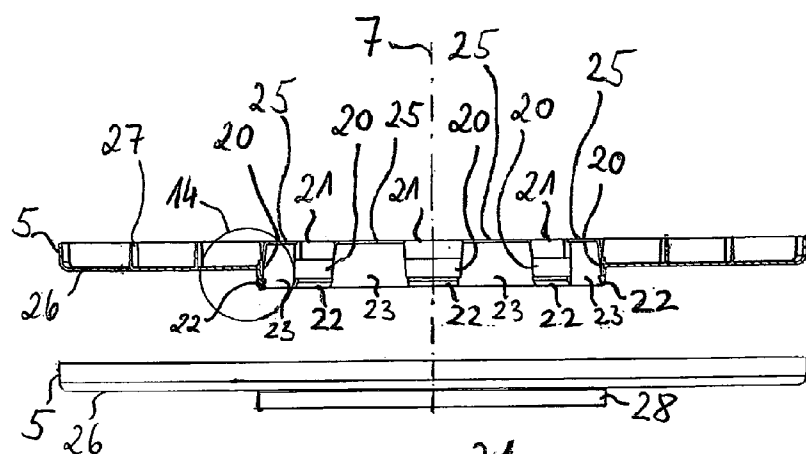


Fig. 5

Fig. 6

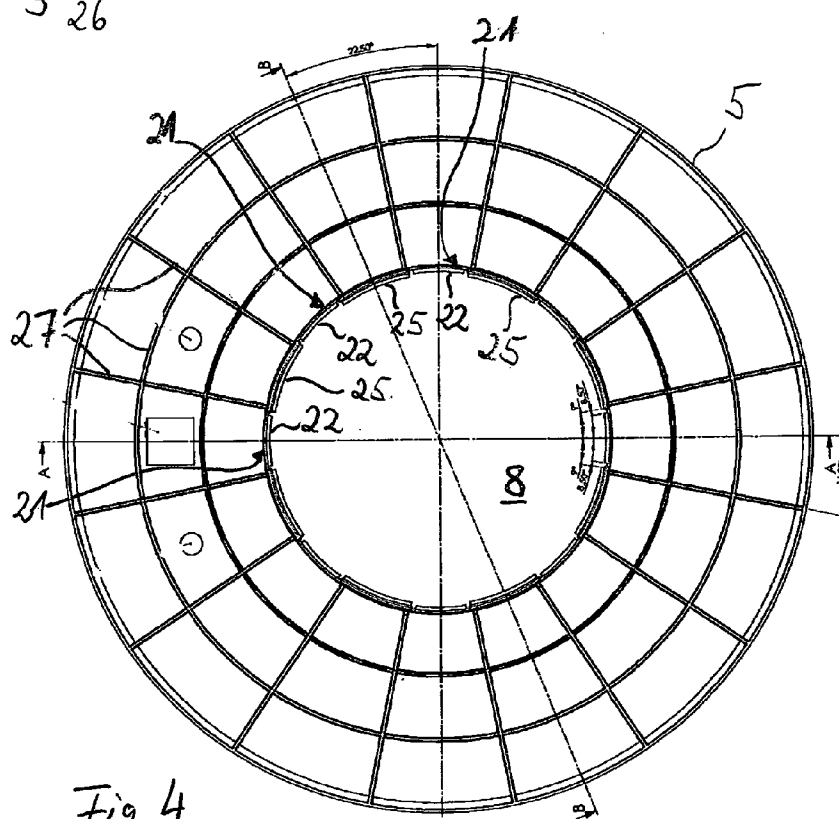


Fig. 4

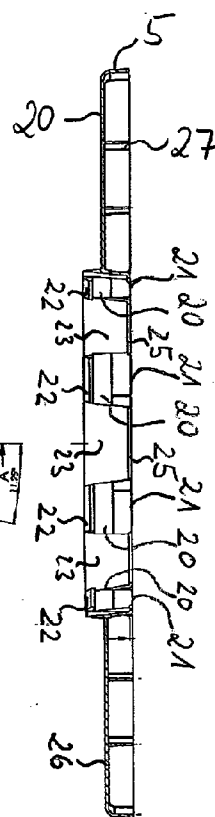


Fig. 7

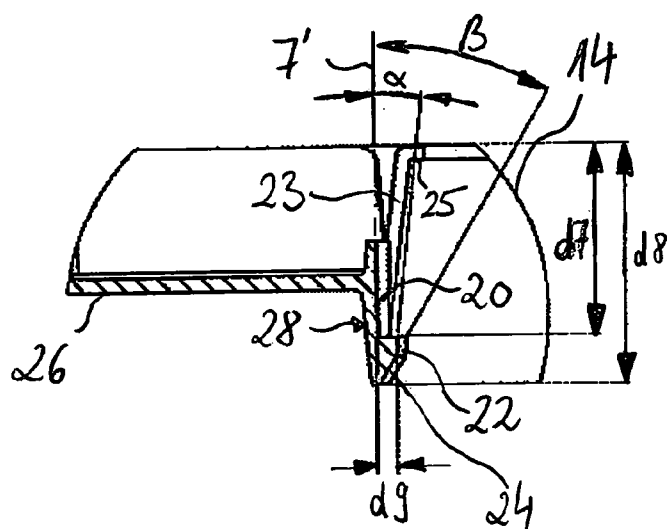


Fig. 8

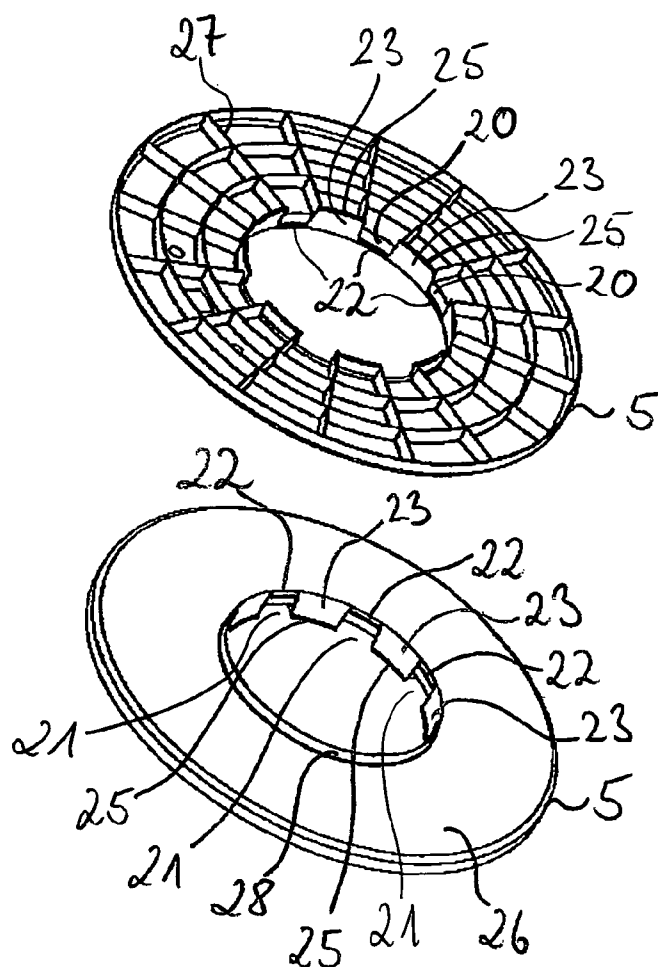
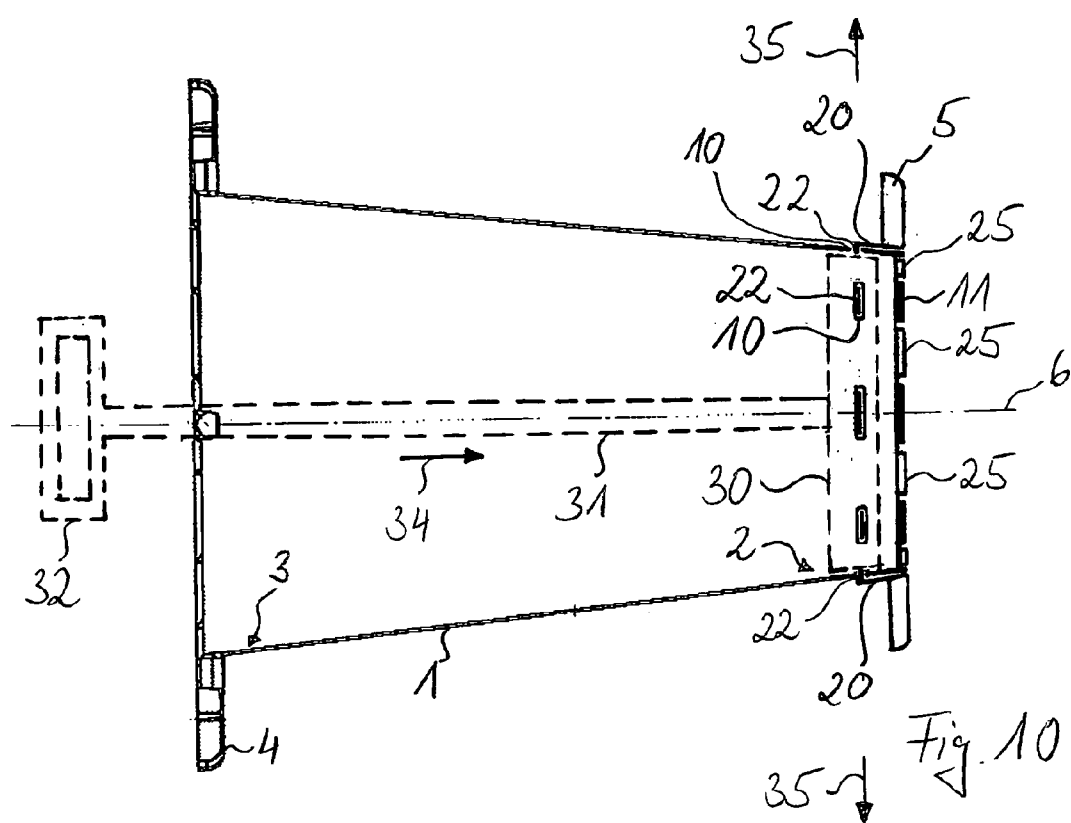
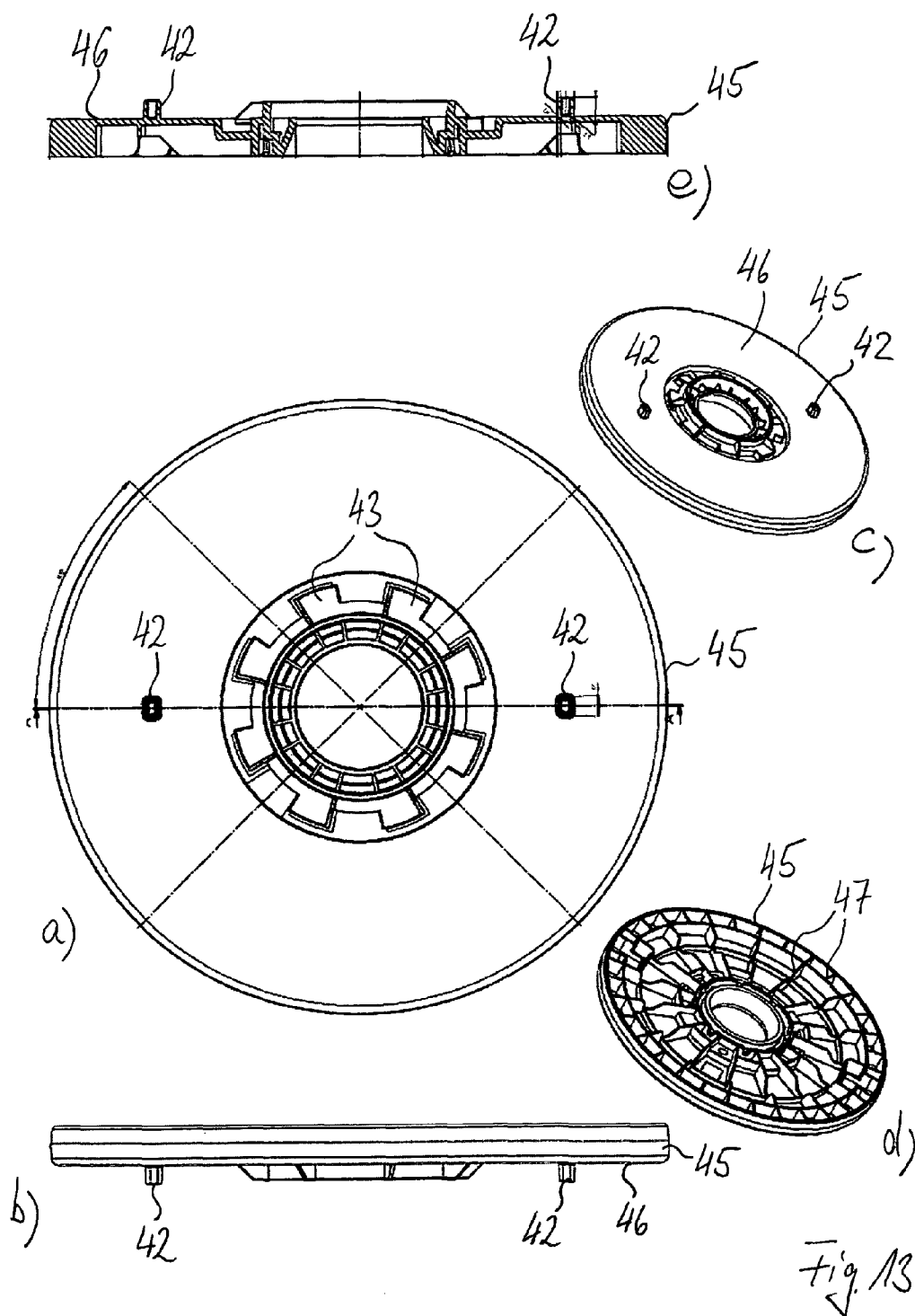


Fig. 9







## SPOOL FOR RECEIVING WINDING MATERIAL AND SPOOL PART SYSTEM

[0001] The present invention relates to a spool for receiving winding material, and a corresponding spool component system according to the preamble of the independent claims. The invention also relates to corresponding methods for fixing and separating the spool component system and for winding such a spool with a carrier spool.

[0002] From WO 2005/070802 A1, a winding spool for a shippable winding for elongated winding material is known. The winding spool includes a substantially rotationally symmetrical conical winding core, the first end having a smaller diameter than the second end. A first flange is detachably connected to the first end of the winding core, a second flange is tightly fixed to the second end of the winding core. The releasable connection between the first flange and the first end of the winding core is realized in this winding spool by segment latches provided on the first flange, which engage in corresponding latch openings provided on the first end of the winding core. In addition, at the first end of the winding core a so called all around latch directed inwardly towards the axis of rotation is provided which is releasably in engagement with an oppositely directed all around latch on the flange. With the all-around latch, a locking system is implemented, which is similar in its functioning to the well-known closures for paint buckets. The winding spool realized in this form-fitting connection between the winding core and removable flange is here configured altogether in such a way that both, assembly and disassembly of the flange by hand, is possible.

[0003] It is an object of the present invention to indicate a spool for receiving winding material and a corresponding spool component system and a process for winding the spool by means of a carrier spool which, with a simplified construction, allows a reliable fixation of the flange to the spool core and a reliable winding of the spool.

[0004] This object is achieved by the spool and the spool component system, respectively, according to the independent claims.

[0005] According to the invention, one or more second latch portions are provided on the first end of the spool core and one or a plurality of second latch elements are provided at the first flange, wherein the second latch portions are arranged on the spool core in such a manner and the second latch elements are arranged on the first flange and/or designed in such a manner that the second latching elements of the flange engage with the corresponding second latch portions of the spool core, when first latch elements provided on the first flange engage with corresponding first latch portions provided on the first end of the spool core, whereby a form-fitting connection between the first flange and the spool core is produced.

[0006] For fixing the first flange at the first end of the spool core, the same is mounted on the first end of the spool core, and—if the angular position of the first and second latch elements is not the same with respect to the angular position of the respective first and second latch portions—is rotated relative to the spool core until the angular position coincides. When the angular position matches, the first latching elements of the first flange can engage with the corresponding first latch portions of the spool core, while the second latching elements of the first flange can be brought simultaneously into engagement with the corresponding second latch portions of the spool core, by pressing the first flange in the axial

direction, preferably manually, onto the spool core. Hereby, relatively small forces are sufficient.

[0007] However, an engagement of the first and second latch portions and latch elements does not necessarily require a mutual rotation of the spool core and the first flange. Namely, if the first flange is applied in the right position in the circumferential direction, i.e. angular position, the first and second latch elements of the first flange can engage simply by axial sliding of the first flange on the conical spool core in the respective first and second latch portions on the spool core.

[0008] By the invention, it is achieved that in addition to fixing the first flange at the first end of the spool core by means of a plurality of couples of first latch element-latch portion, an additional fixing by means of a plurality of second couples of latch element-latch portion which are different from the first couples of latch element-latch portion occurs.

[0009] By the second couples of latch element-latch portion provided by the present invention, the first flange may be secured to the spool core in a simple manner in addition against twisting. Thereby, a more reliable fixation of the flange at the spool core is reached with a simplified design.

[0010] In a first variant, the spool is a cost-efficient, disposable and single-use spool, i.e. designed for a unique winding with winding material and its unique withdrawal. For reasons of cost-effectiveness, the wall thickness of the spool core in this case is relatively thin and typically 1 to 3 mm, preferably about 1.5 mm.

[0011] With these dimensions, it may be necessary that the single-use spool itself has to be carried during the winding process by an appropriately dimensioned, in particular also conical, standard spool, since this is the only manner that the single-use spool is able to take the winding forces and that the torque of the propulsion of the winder can be transmitted via the standard single spool to the single-use spool. The torque is thereby transmitted through friction and/or form-fit from the standard spool to the single-use spool.

[0012] The first and second latch elements and latch portions can, in this case, be advantageously configured so that a disengagement of the first flange from the spool core is no longer possible without an additional device or a suitable special tool, so that, after use, the spool cannot be readily disassembled, such as by manual operation of a pull tab as the winding spool known from WO 2005/070802 A1. The latch elements or latch portions can be deliberately designed in a way to prevent any misuse of the spool of the invention preferably designed as a single-use spool as separable and possibly reusable spool. In this way, a simple, especially manual, disassembling of the spool for a space-saving return transport of the spool after removal of the winding to a new winding with winding material can be prevented.

[0013] In a second variant, the spool is designed as a reusable spool which is, after a winding and removal of winding material, available for at least another winding and removal of winding material. Here, in order to ensure a sufficiently high mechanical stability and wear resistance of the spool, the spool core has a wall thickness of typically 2 to 5 mm, in particular about 3 mm. Alternatively or in addition, by selecting a suitable material with a higher strength—as compared with the material used for the spool core of a disposable spool—a higher mechanical stability of the spool core can be achieved. A support of the reusable spool by a further spool, as may be provided at a single-use spool, is hereby usually not necessary, but in principle possible when, for example particularly high winding forces occur or particularly high

torque from the winder of the winding device have to be transferred to the reusable spool.

**[0014]** In this variant of the spool, it is advantageous when, after the removal of the winding material, the first flange is removed from the first end of the spool core. Conical spool cores, which have only a second flange at a second end with a larger diameter, can be pushed into each other and stacked in a space-saving manner. With stacked spool cores, first flanges which are preferably also designed stackable can be transported separately to a winding station where the first flanges are then fixed, preferably just before the winding process, again at the first end of the spool core.

**[0015]** In this variant, the first and second latch elements and latch portions may advantageously be designed so that a simple manual and non-destructive disassembly of the first flange from the spool core without an additional device or a suitable special tool is possible.

**[0016]** In order to release a first flange of the spool core of the spool according to the invention, a tool is preferably introduced into the interior of the spool core, which at least partly disengages first and second latch elements in engagement with first and/or second latch portions, respectively.

**[0017]** A tool for secure and non-destructive disassembly of the first flange from the spool core has for example a conical stamp whose outer surface has an inclination to the axis of rotation which substantially corresponds to the inclination of the inner surface of the spool core. A rod is provided on the stamp, by means of which the latter is inserted into the interior and is pushed, in particular pressed, towards the first end of the spool core. Form and extent of the die are chosen such that this stamp can be pushed into the area of the first latch portions and may abut there at the inner shell surface of the spool core. When the first latch elements of the first flange engage from the outside in the first latch portions of the spool core, these are pressed radially to the outside by the extent portion of the conical stamp abutting on the inside in the area of the first latch portions and are disengaged or at least loosened from the form-fitting engagement that the first flange can be removed from the first end of the spool core.

**[0018]** Principally, however, all other sorts of special tools are advantageously. For example, it is possible to design a tool in such a way that it can be inserted from the first end of the spool core in its inner, where it can—for example with the support of a suitable mechanism—press the first latch elements pressing to the inside and engaging with the first latch portions radially to the outside.

**[0019]** In the case of first latch elements, which press from the inner against the first latch portions and engage with the same, the tool can, for example, have the form of a belt with loops which is put in the area of the first latch portions around the outer shell of the spool core and can be tightened with a suitable mechanism, whereby the first latch elements are pressed to the inside and in this way are disengaged with the first latch portions.

**[0020]** In a preferred embodiment of the invention, the first latch portions provided at the first end of the spool core have different angular positions with respect to the rotational axis of the spool core. For example, the first latch portions are displaced by an angle of about 45°, respectively, i.e. with respect to a first latch portion, the next first latch portion is arranged with a misalignment of 45° and the following first latch portion is arranged with a misalignment of 90°. Pending on the number and dimension of the first latch portions, these can also be displaced by smaller or larger angles. In principle,

the angles can also have different dimensions. In total, this measure allows on the one hand a favorable distribution of forces over the surface over the first flange and therefore its reliable axial fixation and, on the other hand, a good securization against twisting can be reached.

**[0021]** Alternatively or additionally, it is preferred that the second latch portions situated at the first end of the spool core have different angular positions with respect to the rotational axis of the spool core. Also in this embodiment, the second latch portions can be displaced with respect to each other, for example by an angle of about 45°, respectively—according to the number and the dimension of the second latch portions, however also by smaller or bigger or angles of different size—. In this embodiment of the second latch portions, a particularly reliable fixation of the first flanges at the spool core against twist can be reached.

**[0022]** Preferably, at least one of the second latch portions has an angular position which coincides with the angular position of one of the first latch portions. This means that at least a first and second latch portion have the same angular position. Hereby, a particularly secure positioning on the one hand and a reliable fixation of the first flange on the other hand is reached.

**[0023]** Preferably, the first latch elements arranged at the flange have different angular positions with respect to the rotational axis of the first flange. Preferably, the first latch elements are each with an angle of about 45° to each other. Depending on the number and the dimension of the first latch elements, these can also be distant from each other by smaller or larger angles. Principally, the angles can also have different dimensions. Hereby, a cost-effective, particularly even distribution of forces over the surface of the first flanges and, therefore, its reliable axial fixation and, on the other hand, a good securization against twisting can be reached.

**[0024]** Alternatively or additionally, the second latch elements have different angular positions according to the rotational axis of the first flanges. In particular, the first latch elements are misaligned by an angle of about 45° to each other, respectively. According to the number and/or the dimension of the second latch elements, these can also be displaced by smaller or larger angles or also by angles of different dimensions. Hereby, a reliable axial fixation of the flanges with a reliable securization against twisting at the same time can be reached.

**[0025]** It is particularly preferred that at least one of the second latch elements has an angular position which coincides with the angular position of one of the first latch elements. Hereby, at least one first and one second latch element has the same angular position. In this embodiment, a particularly secure positioning on the one hand and, on the other hand, a reliable fixation of the first flange is enabled.

**[0026]** In a further advantageous embodiment, the second latch portions are formed as protrusions and/or recesses at the first end of the spool core. This represents a possibility being particularly easy to realize two latch portions at the spool core. At the same time, a particularly good securization against twisting can be reached by the protrusions and the recesses, respectively.

**[0027]** In particular, the protrusions and recesses have an orientation parallel to the rotational axis of the spool core, respectively. The protrusions and recesses are hereby preferably arranged in the area of the face side of the first end of the spool core and constitute hereby toothed or castellated extensions and dents, respectively, at the shell of the spool core.

**[0028]** Alternatively, the protrusions and recesses can, however, also have an orientation parallel to the surface of the shell of the spool core, respectively. The protrusions, arranged preferably in the area of the face side of the first end of the spool core, and recesses are, for example, formed as toothed or castellated extensions and dents, respectively, which preferably align with the preferably tapered shell of the spool core.

**[0029]** Provision can be made for the second latch elements being formed as recesses and/or protrusions at the flange. In this way, the second latch elements can be realized at the first flange as well as a particularly good securization against twisting can be easily realized.

**[0030]** Preferably, the first latch elements and/or the second latch elements are formed in one part with the first flange. The first flange comprising latch elements can hereby be produced in only one process step, for example as a die cast component, which is particularly favorable because of the cost advantages with respect to the advantageous usage of the spool as single-use spool.

**[0031]** In a further advantageous embodiment, interspaces are provided between the first latch elements provided at the first flange, which are adapted to the particularly tapered form of the spool core that the interspaces in the area of the first end abut when the first latch elements of the first flanges engage with the corresponding first latch portions of the spool core. Hereby, a favorable distribution of forces and therefore a particularly secure fixing of the first flange at the spool core is reached. In addition, a manual loosening of the first flange from the spool core can be further hindered.

**[0032]** Preferably, the interspaces have an inner portion, viewed in radial direction, which is inclined with an angle between about 3° and 9°, in particular about 6°, with respect to the rotational axis of the flange. Hereby, a reliable abut of the interspaces at the spool core can be realized in a simple manner.

**[0033]** In a further advantageous embodiment, provision is made for the first latch elements being formed as axial protrusions at the first flange and the protrusions having a latch nose, respectively, which can engage with the corresponding latch portions at the first end of the spool core. Hereby, the axial protrusions run essentially parallel to the rotational axis of the first flanges. The respective latch noses preferably protrude from one end of the axial protrusion in direction to the rotational axis, this means that these are orientated essentially in radial direction to the inside. Hereby, a secure latching of the first latch elements of the first flanges in the first latch portions at the spool core can be realized in an easy manner.

**[0034]** Preferably, the latching nose has a in particular flat slant which, viewed in radial direction, lies inside and inclined by an angle between about 20° and 40° with respect to the rotational axis of the flange, in particular about 30°. An opposite area of the latch nose to the slant runs preferably normal to the rotational axis of the first flange. Thereby, the first latch elements are realized in a sort of barbed hooks, by which the first flange is displaced easily in a first axial direction on the first end of the spool core, in contrast thereto, after the latching of the first latch elements in the corresponding first latch portions at the spool core, cannot be removed non-destructively from the spool core without an additional special tool. In this way, on the one hand, an easy installation as

well as a secure fixation of the first flange is reached and, on the other hand, a simple manual dismounting, which is not desired, can be prevented.

**[0035]** In addition, it is preferred that the first latch elements, viewed in radial direction, can engage from the outside in the first latch portions at the first end of the spool core. Preferably, the first latch elements are hereby formed such that these can be pressed during a winding of the spool core by the winding material in direction of the latch portions, particularly radially to the inside. The first latch elements of the first flange latch hereby from the outside in the first latch portions of the spool core. Thereby it is ensured that, during a winding of the spool with winding material, the same can come to rest on the first latch elements. The occurring forces directed radially to the inside, i.e. to the rotational axis of the flange and the spool core, respectively, contribute to pressing the first latch elements to the inside on the first latch portions, which are therefore held particularly secure in their position, i.e. engaged with these.

**[0036]** Preferably, the latch elements formed as protrusions with latch noses are hereby dimensioned and/or shaped that a great share as possible of the forces exerted by the winding material are transmitted in radial direction on the first latch elements. This is preferably realized in that the protrusions of the first latch elements run essentially parallel to the rotational axis of the first flange or to the surface of the shell of the spool core.

**[0037]** Additionally, it is advantageous if the protrusions of the first latch elements are so high with respect to the base of the first flange facing the spool core that possibly several, preferably a multitude of windings of the winding material can come to rest up on these. Preferably, the height of the protrusions is between 5 and 20 mm, particularly between 8 and 12 mm. With these values, on the one hand, high radial forces in a wound-up spool and, on the other hand, also high forces in an empty spool are ensured such that, in both cases, a particularly secure fixing is attained.

**[0038]** The method for winding an inventive spool with winding material has the following steps: Setting up the spool on a carrier spool which has a preferably conical carrier spool core and at least a flange arranged at an end of the carrier spool core and starting to rotate the carrier spool, wherein the spool put on the carrier spool also starts to rotate and is thereby wound up with fed winding material. This method is characterized in that the flange of the carrier spool is coupled form-fittingly with the support of at least one actuator provided at the flange of the carrier spool with a flange of the spool. By the formfittingly coupling, a particularly reliable transmission of torque from the rotating carrier spool to the spool to be wound up with winding material is ensured. In particular, this is particularly advantageous at acceleration or breaking actions where higher torques occur and can effect that the spool cannot or no longer reliably be driven by the rotating carrier spool and put into rotation. Thereby, a particularly reliable winding of the inventive spool with winding material is attained.

**[0039]** Preferably, the spool is a single-use spool and the carrier spool is a standard or reusable spool, by which the spool is supported during the winding. With respect to the preferred wall thickness of the spool core and the carrier spool core, respectively, the above explanations with respect to a single-use spool and a reusable spool, respectively, apply accordingly.

[0040] Preferably, the inside of the spool core of the spool comes to rest at least partly on the outside of the spool core of the carrier spool by the putting of the spool on the carrier spool and is thereby frictionally coupled with the same. This additional frictional coupling supports the transmission of torques of the carrier spool on the spool, which makes the winding of the spool even more reliable.

[0041] In addition, it is preferred that the at least one actuator provided at the flange of the carrier spool engages at the frictional coupling in at least one interspace between single serrations formed at the flange of the spool. The formed serrations primarily provided for a mechanical strengthening of the flange serve at the same time in order to establish the form fitting, such that no further provisions are necessary at the flange of the spool. The inventive spool has therefore a simple buildup.

[0042] A corresponding carrier spool for use in the above described method for winding a spool has a preferably conical carrier spool core and at least one flange arranged at one end of the carrier spool core and is characterized in that the flange of the carrier spool is provided with at least one carrier by which the flange of the carrier spool can be form-fittingly coupled with a flange of a spool put on the carrier spool.

[0043] An according flange for such a carrier spool for use in the above described method for winding a spool has a flat base and is characterized in that at least one actuator is provided at the base by which the flange of the carrier spool can be coupled form-fittingly with a flange of a spool put on the carrier spool.

[0044] Further advantages, features and possibilities of application of the present invention become evident from the following description in connection with the Figures. It is shown in:

[0045] FIG. 1 Two perspective views of an example of a spool core with a second flange fixed at the spool core;

[0046] FIG. 2 a sectional view of the example shown in FIG. 1;

[0047] FIG. 3 a partial view of the sectional view shown in FIG. 2;

[0048] FIG. 4 a top view of an example of a first flange;

[0049] FIG. 5 a section through the first flange shown in FIG. 4 along the line A-A;

[0050] FIG. 6 a side view of the first flange shown in FIG. 4;

[0051] FIG. 7 a further section through the first flange shown in FIG. 4 along the line B-B;

[0052] FIG. 8 a partial view of the section shown in FIG. 5;

[0053] FIG. 9 two perspective views of the example of a first flange;

[0054] FIG. 10 a sectional view of the example with a fixed first flange shown in FIG. 1;

[0055] FIG. 11 a sectional view of a spool partly put on a carrier spool core;

[0056] FIG. 12 a sectional view of a spool being completely put on a carrier spool core;

[0057] FIG. 13 a flange for a carrier spool in a plan view (a), side view (b), first (c) and second (d) perspective view as well as a sectional view (e).

[0058] FIG. 1 shows two perspective views of an example of a rotationally symmetric conical spool core 1 with at least one first end 2 which has a smaller diameter and a second end 3 which has a larger diameter.

[0059] At the second end 3 of the spool core 1, a second flange core is provided, which is rigidly connected with the

spool core 1, for example by being formed in one part with the spool core 1. Besides a forming in a single part, also every other rigid non-removable connection is possible.

[0060] In the area of the first end 2 of the spool core 1, the first latch areas 10 are provided which are realized in the shown example by an elongated breakthroughs, particularly slits, in the area of the first end 2 of the spool core. The first latch portions 10 can be formed alternatively or additionally also by recesses, particularly with the form of grooves or protrusions, particularly with the form of ridges, in the area of the first end 2 of the spool core 1. Furthermore, at the face side of the second end 2 of the spool core 1, two latch portions 11 are provided, which are realized in the shown example by toothed protrusions at the face side of the first end 2 of the spool core.

[0061] In the shown example, in total eight first latch portions 10 as well as eight second latch portions 11 are provided at a second end 2 of the spool core 1. Principally, there can be provided also more or less first or second latch portions 11 and 12, respectively. In the shown example, the number of the first and the second latch portions 10 and 11, respectively, is identical. This number can also be different. For example, six first latch portions 10 can be in the form of slit breakthroughs and only two second latch portions can be provided in the form of toothed protrusions.

[0062] The single first and second latch portions 10 and 11, respectively, have each a certain angular position with respect to the rotational axis of the conical spool core 1. In the shown example with eight first and two second latch portions 10 and 11, respectively, the first latch portions 10 as well as the second latch portions 11 are each arranged with angular distances of 45 degrees with respect to each other. In addition, the angular position of the first latch portions 10 is identical to the angular position of the second latch portions 11, i.e. a first as well as a second latch portion 10 and 11, respectively, are at a certain angle. Alternatively, it is possible that the first latch portions 10 have a different angular position compared to the second latch portions 11.

[0063] FIG. 2 shows a side view of the example shown in FIG. 1, wherein the above explanations with respect to FIG. 1 apply correspondingly.

[0064] As can be deduced from FIG. 2, the angular position of the first and second latch portions 10 and 11, respectively, are identical with respect to the rotational axis 6 of the spool core 1.

[0065] The diameter d1 of the first end 2 of the spool core 1 is smaller as the second diameter d2 of the second end 3 of the spool core 1. Typical values of the first diameter d1 are about 180 mm, typical second diameters d2 are at about 260 mm. The outer diameter d3 of the second flange 4 is typically at about 390 mm and can be chosen, according to the application and/or the holding capacity of the spool, considerably larger or smaller. This is also valid for the first and second diameter d1 and d2 accordingly, respectively. The conical wall of the spool core 1 is typically inclined by 6° with respect to the rotational axis 6 and has typically a wall thickness of 1.5 mm.

[0066] A section 13 of the example shown in FIG. 2 is shown augmented in FIG. 3. A first latch portion 10 provided in an area of the first end of the spool core 1 with the form of a rectangular breakthrough through the spool core 1 has a width d4 of about 5 mm and a length d5 of about 30 mm. The height d6 of the second latch portion 11 formed as a protrusion on the face side of the first end 2 is, in this example, about 1.5 mm.

[0067] Principally, the dimensioning of the first and second latch portions 10 and 11, respectively, can vary considerably from the typical values being only cited as an example here to lower or higher values. In particular, it can be advantageous to choose the height d6 of the second latch portions 11 formed as protrusions considerably larger in order to attain a particular reliable engagement of the second latch portions 11 in corresponding second latch elements of a first flange, as is described in the following in more detail.

[0068] FIG. 4 shows a plan view of an example of a first flange 5 which is put on the first end 2 of the spool core 1 and can thereby be connected with the same. The principal buildup of the first flanges 5 is also explained in the following with respect to the FIGS. 5 to 7, wherein FIG. 5 is a section through the first flange 5 along a line A-A, FIG. 6 is a side view of the first flange 5 and FIG. 7 shows a further section through the first flange 5 along the line B-B.

[0069] As can be seen from the top view of the two sectional representations, the first flange 5 has a flat base 26 with a circular breakthrough 8, which is arranged coaxially to the rotational axis 7 of the first flange 5. The base 26 is stabilized in its back area by a multitude of formed ridges 27.

[0070] On the front side of the base 26 opposite to the ridges 27, a circular area 26 is provided, which is attached to the breakthrough 8 and is preferably formed in one piece at the breakthrough 8 of the first flange 5.

[0071] In the inner circumferential area of the circular area 28, first latch elements 20 are provided, which are formed as protrusions which are oriented essentially parallel to the rotational axis 7 of the flange 5 and which have at one end a latch nose 22 in the form of a protrusion which is oriented radially to the inner, i.e. to the rotational axis 7 of the first flange 5.

[0072] Two latch elements 21 are provided in the area of the other end of the first latch elements 20, which are formed in the shown example by gaps between interspaces 23 formed at the first flange. The interspaces 23 have in the area of the first flange being opposite to the base 26 radial protrusions 25, which are separated by the above cited gaps between interspaces 23.

[0073] Principally, the two latch elements 21 can also be realized by other measures, for example by recessions or openings in the area of the first flange 5 opposite to the base 26. For example, it is possible that the second latch elements 21 are realized by ends of the ridges 27 protruding radially in the circular breakthrough 8 of the first flange 5 between which each a second latch portion 11, preferably in the form of an axial protrusion, can be brought in engagement and, therefore, securing against twisting of the first flange with respect to the spool core 1 can be reached.

[0074] The second latch portions 11 being preferably formed as dentoid protrusions on the face side of the spool core 1 (see FIGS. 1 to 3) and the second latch elements being preferably formed as gaps or recesses on the first flange 5 are arranged and dimensioned such that these can be brought in engagement with each other. At the same time, the first latch element 10 at the first end 2 of the spool core 1 are arranged in the form of slits or recesses or openings arranged and dimensioned such that the latch noses 22 of the first latch elements 20 at the first flange 5 can engage with these. In this way, it can be attained that a form-fittingly fixation of the first flange 5 at the first end 2 of the spool core 1 takes place by engagement of the first edge elements 20 and the latch portions 10 as well as simultaneously the second latch elements 21 and the latch portions 11.

[0075] A form-fittingly connection between the first flange 5 and the first end 2 of the spool core 1 is hereby only possible when the angular position of the first flange with respect to the spool core 1 is chosen such that both the first and the second latch element—latch portion—couples 20/10 and 21/11, respectively, can be brought in engagement with each other.

[0076] FIG. 8 shows an augmented detail 14 of the section through the first flange 5 shown in FIG. 5. Besides, a detail of the base 26, the first latch element 20 in form of a protrusion integrated in the inner extent of the circular area 28 can be seen, which extends parallel to an axis 7', which preferably runs parallel to the rotational axis 7 (see FIG. 5) of the first flange 5 or which is inclined by a small angle, for example between 0.25° and 1°, particularly 0.5° against the same.

[0077] On the—viewed radially—inner side of the axial protrusion of the first latch elements 20, a first latch nose 22 is arranged which has a chamfer 24. The chamfer 24 is inclined with respect to the axis 7' and/or the rotational axis 7 of the first flange 5 by an angle  $\beta$  between about 20° and 40°, particularly about 30°. The height d7 of the lower end and the height d8 of the above end of the latch nose 22 with respect to the rearward end of the first flange 5 are preferably about 20 mm and 25 mm, respectively. The radial extension d9 of the latch nose 22 is preferably about 2 mm. According to the application, the dimensioning, arrangement and form of the latch nose 22 can vary considerably of these sizes, however. For example, the radial extension d9 can be considerably larger as 2 mm, for example in order to secure a particularly reliable fixation of the first flange 5 on the spool core 1 if, for example, the spool has to hold a lot of winding material. The same applies correspondingly for the other here cited parameters.

[0078] In FIG. 8, also the intermediate range 23 can be seen, which lies—with respect to the drawing plane—behind the first latch element 20 and which has at its lower end a radial protrusion 25, which forms together with other protrusions (see FIGS. 4 and 5) interspaces or gaps which realize the second latch elements 21 in the shown example. The intermediate ranges 23 are preferably inclined by an angle  $\alpha$  between 3° and 9°, particularly about 6°, with respect to the axis 7' and the rotational axis 7, respectively, of the first flange 5 and are preferably formed such that these can abut at the shell in the area of the first end 2 of the spool core 1. The intermediate ranges 23 abut hereby preferably at areas of the spool core 1, which are situated between the first latch portions 10.

[0079] FIG. 9 shows two perspective views of the example of a first flange 5. The lower part of the U shows a first flange 5 essentially seen from the base 26, whereas the above part of the U shows the first flange essentially seen from its back side provided with ridges 27.

[0080] Also with respect to this representation, the arrangement and form of the first latch elements 20 lying in the inner of the circular area 28 including latch nose 22 as well as the second latch elements 21 in form of interspaces and gaps, respectively, between the intermediate ranges 23 and their radial protrusions 25 are shown. For the rest, the above explanations apply accordingly.

[0081] FIG. 10 shows a sectional representation of the example shown in FIG. 1 with a first flange 5 fixed in the area of the first end 2 of the spool core 1 and a second flange 4 fixed in the area of the second end 3.

[0082] In the representation, first latch portions 10 can be seen as recesses in the form of slots in the spool core 1 in

which latch noses **22** of first latch elements **20** engage from the outside. With exception of the first latch elements **20** arranged at the side, the remaining first latch elements are covered by the shell of the spool core **1** and are therefore in the here chosen representation visible. In addition, second latch portions **11** can be seen, which engage in second latch elements which are formed by areas between radial protrusions **25** at the first flange **5**. For the rest, the above explanation in connection with the FIGS. **1** to **9** apply accordingly.

[0083] In case, that the spool is designed as single-use spool, particularly with relatively low wall thicknesses of the spool core **1** between 1 and 3 mm, the first and second latch portions **10** and **11**, respectively, and latch elements **20** and **21**, respectively, are formed such that an easy and non-destructive loosening of the first flange **5** from the spool core **1** by hand is not possible.

[0084] In this case, as well as in the case of the design of the spool as reusable spool, particularly with high wall thicknesses of the spool core **1** between about 2 and 5 mm, it is also possible that flange **5** is loosened with support of an adequate tool adapted to the respective spool easily, fast and non-destructive.

[0085] The tool shown as an example in FIG. **10** is, for reasons of clearness, only shown dotted and comprises a stamp **30** on which a rod **31** is installed, provided with a handle **32**. Preferably, the tool is inserted from the second end **3** of the spool core **1** in the inner of the spool.

[0086] The stamp **30** preferably has a conical form which is adapted to the form of the inner shell of the spool core **1**, in particular in the area of the first latch portions **10**, and can be realized for example as rotationally symmetric disk or cap.

[0087] The stamp **30** can be displaced by a user with the handle **32** and the rod **31** in direction **34** on the first end **2**, where it can be brought finally in the area of the first latch portions **10** in abutment with the inner shell of the spool core **1** and thereby presses the latch noses **22** of the first latch elements **20**, engaging in the first latch portions **10** from the outside radially to the outside.

[0088] In this way, the first latch elements **20** are disengaged with the corresponding first latch portions **10** such that the first flange **5** can be removed without problems in direction **34** from the spool core **1**.

[0089] A lifting of the first flange **5** in the direction **34** parallel to the rotational axis **6** is not hindered by the second latch portions **11** and latch elements **21**, respectively, which are even then in engagement, since these, in the shown example, contribute primarily to an augmented protection against twisting and effects no further fixation in direction **34**. In alternative embodiments, in which (also) the second latch portions **11** and latch elements **21**, respectively, effect an axial fixation of the first flanges **5** at the spool core **1**, the tool has to be designed such that this can also disengage the second latch portions **11** and latch elements **21**, respectively, at least partly in order to render possible a loosening of the first flange **5**.

[0090] Depending on the design of the first latch elements **20**, in particular the latch noses **22** and/or of the first latch portions **10**, it is also possible that the first flange **5** of spool core **1** can be removed without any further application of force if the latch noses **22** can be pressed by the stamp **30** a small distance in direction **35** radially to the outside without, however, disengaging these fully from the latch portions **10**. The axial forces exerting in this state, this means during a part engagement between the latch noses **22** and the correspond-

ing first latch portions **10** can be overwound by relatively small forces in direction **34** during the removing of the first flange.

[0091] FIG. **11** shows a sectional view of the inventive spool **9**, which is partly put on a carrier spool core **41** of a carrier spool **49**. At both ends of the spool core **1** of the spool **9**, a first flange **5** and a second flange **4**, respectively, are installed. The above explanations for installing the flanges **4** and **5** at the spool core **1** apply accordingly.

[0092] The spool **9** is in the here shown example a single-use spool, wherein the wall thicknesses of spool core **1** are relatively thin and typically 1 mm to 3 mm, preferably about 1.5 mm. On the other hand, the carrier spool **49** is a reusable spool whose wall thickness of the carrier spool core **49** is higher as at the single use spool and typically between 2 mm and 5 mm, particularly about 3 mm.

[0093] In the shown example, a second flange **44** is provided in the here shown representation at the above end of the carrier spool core **41** which is rigidly connected with the carrier spool core **41** in which the same is, for example, formed in one part with the carrier spool core. Alternatively to a design in one part, every other fixed connection, which can particularly not be loosened, is possible.

[0094] The other, in this representation lower, end of the carrier spool core **41** is designed such that it is detachably connected with the first flange **45** of the carrier spool **49**. A detachable connection can hereby be realized, for example, by segment latches provided at the first flange **41** which engage with corresponding latch openings provided at the open end of the carrier spool core **41**, as for example known from the wound spool from WO 2005/0700802 A1.

[0095] On the side facing the carrier spool core **41** of the first flange **45**, two carriers **42** are provided which are for example formed in one part with the first flange **45**, as these are for example formed together with the first flange **45** in a single die mold process. Principally, it is also possible that the carriers **42** are installed afterwards at the flange **45**, for example by plugging, screwing or gluing.

[0096] The first flange **5** of the spool **1** has an essentially flat base **26**, on whose backside, i.e. the side averted from the spool core **1**, ridges **27** are formed whose function is primarily to stabilize mechanically the base **26** of the flange **5**. With respect to the position and the design of the single ridges **27**, it is referred to the example of an embodiment in the FIGS. **4**, **5** and **7** of a first flange **5** including the respective explanations.

[0097] In the present example, at least a part of the ridges **27** formed on the base **26** are arranged such that these form an interspace in which the respective carrier **42** can engage at the first flange **45** of the carrier spool **49** when the spool **9** is put completely on the carrier spool core **41** and the first flange **45** is, preferably detachably, fixed at the open end of the carrier spool core **41**. This is shown in FIG. **12**.

[0098] By the engagement of the carrier **42** provided at the first flange **45** in the interspaces provided between the single ridges **27** on the backside of the first flanges **5** of the spool **9**, a form-fittingly connection between the first flange **45** and the carrier spool **49**, on the one hand, and the first flange **5** on the spool **9**, on the other hand, is established. Preferably, the coupling of the two spools **9** and **49** is enhanced additionally in that the inside of the spool core **1** of the spool **9** abuts at least partly at the outside of the carrier spool core **41** of the carrier spool **49** and whereby the spool core **1** is coupled frictionally with the carrier spool core **41**.

[0099] The coupled spools 9 and 49 can be placed in a winding device (not shown), in which the carrier spool 49 rotates around the symmetrical axis 6. This can be preferably accomplished in that the first flange 45 of the carrier spool 49 is placed on a spool seat which is propelled by a motor and thereby rotated. Preferably, the second flange 44 of the carrier spool 49 is hereby coupled with a further spool seat which is also rotatable seated, however, which does not have to be powered motorically and which serves essentially as mechanical stabilization for the rotating spools 9 and 49 during the winding.

[0100] FIG. 13 shows a first flange 45 of the carrier spool 49 in different representations. In the shown top view (a), holding protrusions 43 can be seen, by which the first flange 45 is detachably fixed at the lower end of the carrier spool core 41 of the carrier spool 49, as the holding protrusions 43 engage under corresponding latch protrusions which are arranged at the free end of the carrier spool core 41. With respect to further details of the design of the holding protrusions 43 as well as the corresponding latch protrusions on the carrier spool core 41, it is referred to WO 94/13570 A1.

[0101] In addition, two carriers 42 can be seen in the shown top view (a). These are formed in the present example at a side of the base 46 of the first flange 45, as can be seen from the side view (b), the first perspective view (c) as well as the sectional view (e).

[0102] The second perspective view (d) shows the first flange 45 of the carrier spool 49 from the backside of the base 46, which is provided there with a multitude of reinforcing ridges 47.

1. A spool for receiving winding material with a rotationally symmetrical, particularly conical spool core for receiving the winding material, comprising: the core has a first end and one or more first latch portions, and a first flange having one or a plurality of first latch elements; and

one or more second latch portions are provided at the first end of the spool core and one or a plurality of second latch elements are provided at the first flange, wherein the second latch portions are formed at the spool core and the second latch elements are formed at the first flange in such a manner that the second latch elements are engaged with respective second latch portions when the first latch elements are engaged with the corresponding first latch portions.

2. The spool of claim 1, wherein the first latch portions have different angular positions with respect to an axis of rotation of the spool core.

3. The spool of claim 1, wherein the second latch portions have different angular positions with respect to an axis of rotation of the spool core.

4. The spool of claim 2, wherein at least one of the second latch portions has an angular position which corresponds to the angular position of the first latch portions.

5. The spool of claim 1, wherein the first latch elements comprise different angular positions with respect to an axis of rotation of the first flange.

6. The spool of claim 1, wherein the second latch elements comprise different angular positions with respect to an axis of rotation of the first flange.

7. The spool of claim 5, wherein at least one of said second latch elements has an angular position coinciding with the angular position of one of the first latch elements.

8. The spool of claim 1, wherein the second latch portions are formed as projections and/or recesses on the first end of the spool core.

9. The spool of claim 8, wherein the projections or recesses have a parallel orientation to a rotation axis of the spool core.

10. The spool of claim 8, wherein the projections or recesses have an orientation parallel to a circumferential surface of the spool core.

11. The spool of claim 1, wherein the second latch elements are formed as recesses and/or protrusions on the first flange.

12. The spool of claim 1, wherein the first latch elements and/or the second latch elements are integrally formed with the first flange.

13. The spool of claim 1, wherein between the first latch elements intermediate regions are provided which are adapted to the, in particular conical, shape of the spool core such that these abut on the first end of the spool core when the first latch elements are in engagement with corresponding first latch portions.

14. The spool of claim 13, wherein the intermediate regions, viewed in radial direction, have an inner portion, which is inclined with an angle ( $\alpha$ ) between about 3° and 9°, in particular about 6°, with respect to an axis of rotation of the first flange.

15. The spool of claim 1, wherein the first latch elements are formed as axial projections on the first flange and the projections each have a latching nose which can be engaged with the corresponding first latch portion at the first end of the spool core.

16. The spool of claim 15, wherein the latching nose has an, in particular plane, chamfer which, viewed in the radial direction, is located inward and being inclined to the axis of rotation of the first flange at an angle ( $\beta$ ) between about 20° and 40°, in particular approximately 30°.

17. The spool of claim 1, wherein the first latch elements, viewed in radial direction, can engage from the outside in the first latch portions at the first end of the spool core.

18. The spool of claim 17, wherein the first latch elements are formed such that these can be pressed in the direction of the first latch portions, in particular radially inwards, by the winding material during a winding of the spool core with winding material.

19. A system with spool parts, comprising: at least one rotationally symmetrical spool core configured for receiving winding material; wherein the spool core has a first end and one or more first latch portions, and at least one first flange having one or more first latch elements; and

one or more second latch portions are provided at the first end of the spool core and one or a plurality of second latch elements are provided at the first flange, wherein the second latch portions are formed such at the spool core and the second latch elements are formed such at the first flange that by placement of the first flange on the first end of the spool core, the first latch elements can be brought into engagement with the corresponding first latch portions while the second latch elements can be brought into engagement with respective second latch portions.

20. A method for fixing a first flange on a spool core of a subspoolsystem of a spool according to claim 19, comprising: placing the first flange on the first end of the spool core and then rotating the first flange relative to the spool core, until the first latch elements are engaged with the corresponding first

latch portions and the second latch elements are engaged with the corresponding second latch portions.

**21.** A method for releasing a first flange of a spool core of claim **1**, comprising: introducing a tool into the interior of the spool core, and disengaging, at least partially, first and second latch elements being in engagement with the first and/or second latch portions from each other.

**22.** A method for winding a spool with winding material according to claim **1**, comprising the steps of:

Mounting the spool to a spool carrier having a preferably conical carrier spool core and at least one flange arranged at an end of the carrier spool core; and

Setting into rotation the carrier spool, wherein the spool patched on the carrier spool is also set into rotation and is thereby wound with winding material fed; and

the flange of the carrier spool is form-fittingly coupled by means of at least one carrier provided on the flange of the carrier spool with a flange of the spool.

**23.** The method of claim **22**, wherein by mounting this spool onto the spool carrier, the inside of the spool core of the

spool comes to rest at least partially on the outer side of the carrier spool core and is therefore frictionally coupled with the same.

**24.** A method of claim **22**, wherein the at least one carrier provided on the flange of the carrier spool engages in a form-fitted coupling in at least an interspace between single ribs formed on the flange of the spool.

**25.** A carrier spool for use in a method of winding a spool of claim **22**, comprising: a preferably conical carrier spool core and at least one flange arranged at an end of the carrier spool core; and

at least one carrier is provided at the flange of the carrier spool, through which the flange (**45**) of the carrier spool can be form-fittingly coupled with a flange of a spool mounted on the carrier spool.

**26.** A flange with a flat base for a carrier spool for use in a method of winding a spool of claim **22**, comprising:

at least one carrier is provided at the base, through which the flange for the carrier spool can be form-fittingly coupled with a flange of a spool mounted on the carrier spool.

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