

Device for Guiding a Thread

The invention relates to a device for guiding a thread in accordance with the generic type specified in the preamble of Claim 1.

A known device of the type of interest here for guiding a thread includes a holding
5 element serving for mounting purposes and having the form of a shaft member, on the
free end section of which a thread roll is rotatably disposed with sliding fit (e.g. DE 91 13
140 U1). To ensure an easy rotating capacity a central recess of the thread roll, which is
configured as a cylindrical passage receiving the shaft member, must have an inside
10 diameter that is sufficiently larger than the outside diameter of the likewise cylindrical
shaft member, said diameter amounting to 1 mm to 2 mm, for example. As a result, in
particular when the device is used in the textile industry and in knitting machines, for
example, dirt, lint and fluff particles, thread residues and other contaminants can enter the
bearing gap between the shaft member and the thread roll. As a consequence of this, the
mounting for the thread roll becomes increasingly stiffer with time during use, ultimately
15 leading to its stoppage, so that the device must be cleaned frequently and even replaced.
In spite of the advantage that in the known device the thread roll is fastened to the shaft
member to be axially releasable by means of a snap connection, additional work effort and
undesirable machine outages can occur as a result. Moreover, a disadvantage is that
fouling of the bearing gap can cause varying thread tensions of the transported threads,
20 and thus in the case of knitting machines can result in different stitch sizes or different
quality of the produced knitted product, although an extreme smooth running ability of the
thread rolls is required particularly with the guidance of elastic threads.

Similar problems arise when the thread roll is held to be axially non-displaceable in a
25 known manner with a clamping ring fastened centrally on the holding element or is
rotatably disposed on the holding element by means of a ball bearing (e.g. DE 926 805).

Therefore, a device of the aforementioned generic type is already known, in which the
penetration of dirt particles or the like into the bearing gap is to be prevented by the
30 thread roll being provided on its one axial end with a fully closed attachment and on its

opposite end with a protective shield in the form of a cover plate or the like covering the bearing gap and partially provided with sharp sealing edges. However, it has not been possible hitherto to provide a satisfactory solution to the described problem with such a device. Moreover, the protective shield hinders simple dismantling, cleaning and/or
5 replacement of the thread roll.

Working from this, the object forming the basis of the invention is to configure the device of the aforementioned generic type such that the penetration of dirt particles in the form of fluff, lint, dust and the like can be substantially prevented, the intervals between cleaning
10 are increased as a result of this and a favourable dismantling ability is enabled in the case of any necessary cleaning or replacement of the thread roll.

This object is solved with the characterising features of Claim 1

15 A significant reduction in fouling tendency of the device is surprisingly achieved with the non-rotatable arrangement of the protective shield according to the invention. One reason for this could be that the comparatively high fouling tendency in the known devices is caused not only by any dirt particles present being able to penetrate into the open ends of the bearing gaps, but also fibres, thread residues or the like being looped around the
20 adjoining parts of the holding element through the rotating thread roll and therefore collecting on this holding element and then gradually being increasingly drawn into the open gaps. This effect is evidently prevented when using a stationary non-rotatable protective shield, which counteracts the fouling tendency. In spite of this arrangement of the protective shield according to the invention, however, the device can be configured so
25 that the thread roll can be easily removed from the holding element and attached onto this again.

Further advantageous features of the invention may be seen from the sub-claims.

30 The invention shall be explained in more detail below by way of embodiments in association with the attached drawings:

Figure 1 is a schematic perspective view of a device for guiding a thread according

to the invention;

Figure 2 shows an axial section through a first embodiment of the device according to the invention taken approximately along the line II-II in Figure 1; and

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Figures 3 to 5 are sectional views corresponding to Figure 2 through three further embodiments of the device according to the invention.

Figure 1 schematically shows a thread guide 1, which guides a base thread (not shown) and an elastomer thread 2, for example. The base thread is guided in the usual manner, while the elastomer thread 2 is guided with a device according to the invention given the general reference 3. This device 3 includes a holding element 4 and a thread guide roll or in short thread roll 5 rotatably disposed on an end section 4a (Figure 2) of the holding element 4. Another end section of the holding element 4 is arranged in a hole of a mounting 6 fastened to the thread guide 1 and is fixedly connected to the mounting 6 by means of a fastening screw. On the outer periphery, the thread roll 5 has, for example, a customary V-shaped circumferential groove 5a for the thread 2, wherein the cross-section of the circumferential groove 5a decisive for the course of the thread amounts to 11 mm, for example.

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Devices 3 of this type are provided on circular knitting machines, for example, as is generally known to the person skilled in the art, and do not therefore need to be explained in more detail (e.g. DE 91 13 140 U1).

25 In the embodiment according to Figure 2, in which identical parts are provided with the same references as in Figure 1, the thread roll 5 is configured in two parts. It includes a bearing section 8a located radially on the inside and a thread guide section 8b located radially on the outside, which is provided with the V-shaped circumferential groove 5a, its outside shell face being expediently configured and arranged to be rotationally symmetric and coaxial to a rotational axis 9 of the thread roll 5. The thread guide section 8b is provided with a recessed seat 10, which extends over a large portion of its axial length as far as its one axial end and receives the bearing section 8a. This seat 10 is radially widened at an opposite, open axial end, so that a step is formed, against which a flange 11

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of the bearing section 8a abuts during assembly and thus predetermines the relative axial position of the two sections 8a, 8b in relation to one another. The outer periphery of the bearing section 8a and the inside shell of the thread guide section 8b, which in the assembled state are both arranged coaxially to the rotational axis 9, are preferably
5 connected to one another along an assembly gap formed between them by clamping action, by adhesion or other means for being axially fixed and non-rotatable relative to each other and for forming a structural unit in one piece.

The bearing section 8a additionally has a central, in this case continuous, recess having a
10 cylindrical inside shell, into which recess the end section 4a of the holding element 4 provided with a cylindrical outside shell can be inserted so that the bearing section 8a is arranged on the end 4a in the manner of a slide bearing and is rotatable around the rotational axis 9. As a result of this, inherently, a circular cylindrical bearing gap 12 is present between the inside shell of the bearing section 8a and the outside shell of the end
15 section 4a, said gap 12 having a specific width that can cause dirt, fluff or the like to penetrate and can thus lead to a reduction in the easy rotating capacity or even to locking of the slide bearing.

According to the invention, the bearing gap 12 is covered with a protective shield 14 on
20 the side on which the holding element 4 is mounted on the circular knitting machine or the like. This shield 14 has a central passage through which the holding element 4 projects, and is fixed to the holding element 4 by clamping, adhesion or other means in a fixed, i.e. non-rotatable and sealed manner and so that dirt particles or the like, coming axially from the right in Figure 2, are held back by the protective shield 14 and cannot reach the
25 bearing gap 12. In the embodiment, the protective shield 14 consists of a thin plate, the external cross-section of which is preferably substantially larger than the diameter of the bearing gap 12 at the associated end of the bearing section 8a. As a result, it is also practically impossible for lint or the like from radial directions to penetrate into an interstice located between the thread roll 5 and the protective shield 14, the width of
30 which needs only be so large that the thread roll 5 can rotate freely and is not be braked by the fixed protective shield 14.

For axial fixture of the thread roll 5 on the end section 4a, the latter has a circumferential

groove 16, which forms a catch groove, expediently lies in the vicinity of the face on the free end of the end section 4a and can receive a catch projection 17. The, for example, bead-shaped, catch projection 17 projects radially inwards from the inside shell of the recess passing through the bearing section 8a and is configured so that it can either itself
5 elastically deform or is provided on an elastically deformable segment of the bearing section 8a, which can in turn deviate radially when the bearing section 8a is placed onto the holding element 4, with its passage having substantially the same cross-section as the end section 4a.

10 For assembly of the described device 3 the thread guide section 8a is firstly slid onto the bearing section 8a until it abuts against the flange 11 thereof, wherein the axial fixture of position and fixture against rotation is achieved by clamping, adhesion or the like. The structure unit or thread roll 5 thus obtained is then - from the left in Figure 2 - placed onto the holding element 4 or its end section 4a already fixedly connected to the protective
15 shield 14 until the catch projection 17 locks in the circumferential groove 16 in the manner of a snap connection. The thread roll 5 is now disposed on the end section 4a to be easily rotatable, but axially non-displaceable and protected from fouling on the side of the protective shield 14. The created connection can be easily released again, where required, by axially pulling on the thread roll 5.

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To also ensure protection against fouling on the opposite axial end of the thread roll 5, on an end remote from the protective shield 14, the thread roll 5, or its thread guide section 8b in the embodiment, has a fully closed cap-like attachment 18, which itself receives in particular the free end of the end section 4a and in the embodiment also the bearing
25 section 8a. The penetration of dirt or dust into the bearing gap 12 on the left side in Figure 2 is impossible as a result of this.

The embodiment according to Figure 3 differs from the embodiment according to Figure 2 only by the position and the shape of a protective shield 20. Therefore, in Figure 3
30 identical parts are provided with the same references as in Figure 2. Here, the recess of the bearing section 8a of the again two-part thread roll 5 with the end section 4a passing through it has a widened portion 21 at the axial end remote from the attachment 18, the internal cross-section of said widened portion 21 being substantially larger than the

external cross-section of the end section 4a at this location. This widened portion 21 serves to receive the protective shield 20 either completely or partially, as clearly shown in Figure 3. Moreover, on the side remote from the thread roll 5 the protective shield 20 preferably has its smallest external cross-section, which gradually increases from there 5 towards the thread roll 5 and expediently increases conically. The sloping peripheral face of the protective shield 20 thus formed expediently extends to close to the inside shell of the widened portion 21. As a result, the easy rotating capacity of the thread roll 5 is not impaired, while on the other hand an open air gap 22, through which dust and dirt particles could penetrate, remains only in a region that is radially comparatively far from 10 the rotational axis 9. Moreover, here the fixed protective shield 20 also prevents threads or thread residues from being wound around the holding element 4 by the rotating thread roll 5 and being drawn into the actual bearing gap 12 in a region close to the rotational axis 9.

15 Otherwise, the device according to Figure 3 corresponds to the device according to Figure 2.

Figure 4 shows a further embodiment of the device 3. A holding element 23 is combined here with a protective shield 24 to form a structural element that can be produced in one 20 piece. For this purpose, the holding element 23 has an end section 23a being located axially at a front end and being provided with a cylindrical outer periphery, and a mounting section 23b located axially at a rear end, wherein the end section 23a has a substantially larger external cross-section than the mounting section 23b and/or the end section 4a acting as axis in Figures 2 and 3. The end section 23a has a cylindrical outside 25 shell around which a thread roll 5 can rotate that is a single part here. The thread roll 5 has a recess 25, into which the end section 23a can be inserted coaxially and which is provided with a cylindrical inside shell, which in the inserted state of the end section 23a forms a circular cylindrical air gap 26 with the outside shell thereof, said air gap 26 being dimensioned in accordance with a smooth-running slide mounting arrangement and 30 substantially corresponding to air gap 22 of Fig. 3. The end section 23a and the thread roll 5 are rotationally symmetric and coaxial to the rotational axis 9.

In the embodiment of Figure 4 the protective shield 24 is formed by a transition section of

the holding element 23 and arranged between the end section 23a and the mounting section 23b. This transition section has an external cross-section that from the mounting section 23b gradually becomes larger towards the end section 23a and preferably increases conically. As a result, in the same manner as the practical example of Figure 3, the air gap 26 is located at a comparatively large radial distance from the rotational axis 9 and the protective shield 24 forms a sloping, stationary ramp, which counteracts the winding of thread residues or the like and protects the air gap 26 from contaminants.

The end section 23a according to Figure 4 is preferably hollow cylindrical and is thus provided with a seat 27, into which an insert 28 projects at least partially. The insert 29 is also hollow cylindrical and has a shaft member 29 at least partially passing through it. Member 29 at an end of the end section 23a remote from the mounting section 23b also passes through a cap-like attachment 30 of the single-part thread roll 5 that corresponds to the attachment 18 according to Figure 3. In the assembled state according to Figure 4, the bearing section 23a, the insert 28, the shaft member 29 and preferably also the attachment 30 are arranged coaxially to one another and to the rotational axis 9. In this case, the shaft member 29 is preferably fixedly connected to the attachment 30 to form a seal and rotatably disposed in the insert 28, which in this case is fixedly connected to the bearing section 23a by clamping, adhesion or the like. On account of this configuration, a bearing gap 12a to be protected is formed between the insert 28 and the shaft member 29, said gap 12a corresponding to bearing gap 12 in Figures 2 and 3. For releasable assembly of the thread roll 5 it is proposed, similar to Figures 2 and 3, to provide the shaft member 29 with an outer circumferential groove 31, which forms a snap connection with a radially inward pointing catch projection 32 provided on the insert 28. As a result, the prefabricated structural unit consisting of the thread roll 5 and shaft member 29 can be inserted axially - from the left in Figure 4 - into the likewise prefabricated structural unit consisting of the holding element 23 and the insert 28 or be released from this again, if necessary.

Otherwise, the embodiment according to Figure 4 corresponds to the embodiments according to Figures 2 and 3, and therefore the same references have been used for identical parts.

A embodiment of the invention currently considered the best is shown in Figure 5. In the same manner as Figure 4, the thread roll 5 is configured in a single part. It has a recess 33 coaxial to the rotational axis 9, which at one end has a radial widened portion 33a forming a radial shoulder and receiving a protective shield 34. The internal cross-section 5 of the widened portion 33a is significantly larger than the external cross-section of the holding element 4 that is configured the same as in Figures 2 and 3. On a side facing the thread roll 5, the protective shield 34 has an axial projection with a stepped cross-section and containing a central section 34a and an assembly section 34b at the end. Both the protective shield 34 and the projection 34a, 34b have a passage running through them, 10 with which the protective shield 34 is slid onto the holding element 4. Moreover, the protective shield 34 can be connected to the holding element 4 by clamping in an axially non-displaceable and non-rotatable but also releasable manner. For this purpose, like in Figures 2 to 4, the end section 4a of the holding element 4 has the circumferential groove 16, into which a resiliently configured or resiliently disposed catch projection 35 provided 15 on the assembly section 34b of the protective shield 34 can engage when the protective shield 34 is slid axially onto the holding element 4. In this case, the end section 4a and the assembly section 34b preferably have substantially the same, but non-circular external or internal cross-sections so that after engagement of the catch projection 35 in the circumferential groove 16 the protective shield 34 is not only connected to the holding 20 element 4 in an axially fixed manner, but also in a non-rotatable manner. The snap connection thus formed can also be released again, where necessary, by pulling axially on the protective shield 34 or the thread roll 5.

In contrast to Figures 2 to 4, the thread roll 5 in the embodiment according to Figure 5 is 25 not disposed to be easily rotatable on the holding element 4 by means of a slide bearing, but by means of a ball or roller bearing 36. For this purpose, e.g. an inner race of the bearing 36 is fastened on the assembly section 34b of the protective shield 34, for example, by a sufficiently firm clamping fit, whereas the outer race of the bearing 36 is fastened fixedly to the inner periphery of the recess 33 of the thread roll 5. The thread 30 roll 5 is therefore rotatably disposed on the holding element 4 indirectly, and not directly, via the assembly section 34b.

As Figure 5 shows, the external cross-section of the assembly section 34b is smaller than

the internal cross-section of the recess 33 to a sufficient degree to allow sufficient space for the bearing 36. In contrast, the external cross-section of the central section 34a is only slightly smaller than the internal cross-section of the recess 33, so that in the assembled state of the device a narrow air gap 37 is formed that allows smooth-running rotation of the thread roll 5 relative to the protective shield 34 and that substantially corresponds to the air gaps 22 and 26 in Figures 3 and 4. To the outside the air gap 37 and the bearing 36 are protected from contaminants by a plate-shaped section 34c of the protective shield 34 that covers them radially and comes to lie in the widened portion 33a. In addition, a narrow air gap 38 is expediently provided between the inside of the section 34c and an end face of the thread roll 5 facing it, so that the free rotating capacity of the thread roll 5 is not hindered at this location by the protective shield 34. A defined width of the air gap 38 can be achieved, for example, by fixing the axial position of the bearing 36 by means of a step 39 on the inner periphery of the thread roll 5 and also by means of a step 40 between the two sections 34a, 34b of the projection 34. Surprisingly it was discovered that a somewhat broader air gap 37 leads to a longer lifetime as compared with a too small air gap 37 in this embodiment. This possibly is a result of the fact that dirt, fluff or the like that has entered the air gap 37 does not lead to a remarkable diminuation of the free rotatability of the tread roll 5.

As a result of the stationary protective shield 34 and the stepped form of its projection 34a, 34b, an excellent seal is obtained on an axial end of the bearing 36. At the opposite end the possibility of fouling by dust, lint or the like is excluded, as in the other embodiments, by the attachment 30 of the thread roll 5.

If it is intended to release the thread roll 5 from the holding element 4, the entire structural unit consisting of the thread roll 5, protective shield 34 and bearing 36 can be pulled off axially to the left in Figure 5 releasing the snap connection (parts 16, 25). The clamping connection between the protective shield 34 and the inner race of the bearing 36 can then be released, if required.

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The thread roll 5 or its parts 8a and 8b as well as the insert 28 are preferably made of plastic injection mouldings and it is particularly advantageous if they are made from plastics with good sliding properties and, like the protective shields 14, 20, 24 and 34, are

made from a material with antistatic effect.

The invention is not restricted to the described embodiments, which can be modified in a variety of ways. It is possible, for example, to arrange the circumferential or catch groove 5 16, 31 in the inside shell of the respective passage of the bearing section 8a, the insert 28 or the assembly section 34b and arrange the catch projection 17, 32 or 35 on the outside shell of the end section 4a or the shaft member 29, or to provide these parts in any other expedient manner. In this case, the axial positions of the catch projections and the catch grooves can be selected as may be seen from Figures 2 to 5. In addition, it could be 10 provided that a respective catch projection 17, 32 or 35 and a corresponding catch groove 16, 31 are arranged at both axial ends of the thread roll 5 in order to thus even further restrict fouling in the bearing gap 12 and 12a as well as in the region of the bearing 36. In addition, it should be understood that the device 3 according to the invention can also be applied to machines other than circular knitting machines and for guidance of thread other 15 than textile threads, in particular also thin strips or wires, glass fibres or the like.

Moreover, a similar assembly would also be possible with differently configured thread guide rolls, in which case in particular a different colouration, e.g. a black and white colouration, of the thread roll 5 is expedient to thus render any stoppage of a thread roll directly recognisable even from far away. The structure of the protective shields 14, 20, 20 24 and 34 can also be different from the illustrations in Figures 2 to 5, in particular with respect to the relative size dimensions and cross-sectional forms, wherein in particular the protective shields 20 and 34 need only project axially into corresponding recesses of the thread roll 5 or its bearing sections 8a. Finally, it should be understood that the different features can also be applied in different combinations from those described and represented.

Patent Claims:

1. Device for guiding a thread (2) or similar, including a holding element (4, 23) intended for its assembly, a thread roll (5) rotatably disposed on the holding element (4, 23) to form a circular cylindrical bearing gap (12, 12a), and a protective shield (14, 20, 24, 34), which covers the bearing gap (12, 12a) at at least one axial end of the thread roll (5) and which has a passage with the holding element (4, 23) projecting through it, characterised in that the protective shield (14, 20, 24, 34) is non-rotatably connected to the holding element (4, 23).
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2. Device according to Claim 1, characterised in that the protective shield (14, 20) consists of a plate arranged at an axial distance from the thread roll (5).
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3. Device according to Claim 1 or 2, characterised in that the protective shield (14, 20, 34) has a maximum external cross-section, which is larger than the cross-section of the bearing gap (12, 12a) at its axial end facing the protective shield (14, 20, 34).
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4. Device according to Claim 1, characterised in that the protective shield (20, 34) lies at least partially in a recess (21, 10a) of the thread roll (5).
- 20 5. Device according to Claim 4, characterised in that on a side remote from the thread roll (5) the protective shield (14, 24) has a smallest external cross-section, which gradually increases from there towards the thread roll (5).
6. Device according to Claim 5, characterised in that the protective shield (14, 24) has a conical outer periphery.
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7. Device according to Claim 4, characterised in that the protective shield (34) has an axial projection (34a, 34b) which projects at least partially in a recess (33) of the thread roll (5) and on which is fastened the inner race of a ball or roller bearing (36) intended for the rotational mounting of the thread roll (5).
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8. Device according to Claim 7, characterised in that a central section (34a) of the

projection forms an air gap (37) and that at the axial end remote from the ball or roller bearing (36) the protective shield (34) has a section (34c) with an external cross-section, which is larger than the cross-section of the air gap (37).

- 5 9. Device according to Claim 7 or 8, characterised in that the projection (34a, 34b) is connected to the holding element (4) by means of a snap connection (16, 36) in a releasable but substantially non-displaceable manner in axial direction.
10. Device according to Claim 1, characterised in that the thread roll (5) is configured
10 in two parts and has a bearing section (8a) being located radially on the inside and having a recess for the holding element (4) and a thread guide section (8b) being located radially on the outside and being projected by the bearing section (8a).
11. Device according to Claim 10, characterised in that the thread guide section (18b)
15 is provided with a V-shaped circumferential groove (5a).
12. Device according to Claim 10, characterised in that the bearing section (8a) and the thread guide section (8b) are fixedly connected to one another.
- 20 13. Device according to one of Claims 10, 11 or 12, characterised in that at an end remote from the protective shield (14, 20, 24, 34) the thread roll (5) has a fully closed cap-like attachment (18, 30).
14. Device according to Claim 13, characterised in that the attachment (18) is provided
25 on the thread guide section (8b).
15. Device according to one of Claims 10, 11 or 12, characterised in that the bearing section (8a) is connected to the holding element (4) in a manner releasable but substantially non-displaceable in axial direction by means of a snap connection (16,
30 17).
16. Device according to Claim 1, characterised in that the holding element (23) has an end section (23a) being located axially at a front portion, being intended for arran-

gement in a recess (25) of the thread roll (5) and being provided with a cylindrical outer periphery, and a mounting section (23b) being located axially at a rear portion, being intended for assembly and having a smaller external cross-section than the end section (23a), and that the protective shield (24) is formed from a transition section having a widening external cross-section and arranged between the mounting section (23b) and the end section (23a).

17. Device according to Claim 16, characterised in that the transition section has an external cross-section, which widens conically from the mounting section (23b) towards the end section (23a).

18. Device according to Claim 16 or 17, characterised in that the end section (23a) is hollow cylindrical.

19. Device according to Claim 18, characterised in that arranged in the end section (23a) is a hollow cylindrical insert (28), which receives a shaft member (29), which is coaxial to the mounting section (23b) and projects partially out of the insert (28) and at an end of the end section (23a) remote from the mounting section (23b) has a section, which projects out of the insert (28) and projects through the attachment (30) provided on the thread roll (5).

20. Device according to Claim 19, characterised in that the shaft member (29) is fixedly connected to the attachment (30) to form a seal and is rotatably disposed in the insert (28).

21. Device according to Claim 19, characterised in that the insert (28) is fixedly connected to the end section (23a) and is connected to the shaft member (29) in a releasable but axially substantially non-displaceable manner by means of a snap connection (31, 32).

22. Device according to one of Claims 1, 4 - 8, 10 - 12 and 16 - 21, characterised in that the thread roll (5) or its parts (8a and 8b), the protective shields (14, 20, 24, 34) and also the insert (28) are made from a sliding material with antistatic effect.