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Description

The invention relates to a threaded sleeve for screwing into a receiving opening of a workpiece.

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Threaded sleeves with a core and a thread mounted on the outside thereof are disclosed in the prior art (see, e.g. EP-A 2 497 962).

10 It has become clear that when the threaded sleeve is screwed into a workpiece, said workpiece tilts and the threaded sleeve is mounted at an angle and this is a disadvantage of the disclosed threaded sleeves. Consequently, the necessary pre-drilling is often made larger, which results in insufficient
15 tensile strength being able to be produced in the connection between threaded sleeve and workpiece. This is because when the threaded sleeve is successfully mounted, the outer thread is not anchored deeply enough in the surrounding workpiece.

20 When the threaded sleeves are mounted in a crooked manner in the workpiece, the result is often the formation of cracks, the workpiece heating up or the deformation thereof. In addition, asymmetrical stress distribution and loading in the workpiece can result in the fracture or destruction of said
25 workpiece.

It is the object of the present invention to provide a threaded sleeve where the screwing-in operation is made easier, the mounting is effected reliably perpendicular to the
30 workpiece and, once it has been screwed-in, a sturdy, loadable connection is ensured between threaded sleeve and workpiece.

The above-mentioned object is achieved by a threaded sleeve with the features of claim 1.

35

According to the invention, the threaded sleeve is suitable for screwing into a receiving opening of a workpiece. The threaded sleeve comprises a core and a thread mounted outside

on the core. The thread comprises three thread turns with the same thread profile. The thread profile of the threaded sleeve has a flank angle 25° to 35° , with an outer diameter of 8 mm to 14 mm the pitch of the thread being in the range of 0.5 to 1.0 times the outer diameter of the threaded sleeve and with an outer diameter greater than 14 mm to 40 mm the pitch of the thread being in the range of 0.25 to 0.65 times the outer diameter of the threaded sleeve.

10 In particular, the threaded sleeve consists of a core and a thread mounted on the surface thereof. The thread extends in a preferred manner over a large part of the length of the threaded sleeve, in particular over substantially the entire length of the threaded sleeve. In this case, a region at one
15 end of the threaded sleeve can be left out so that the threaded sleeve can be inserted and guided in an easy manner. Said region is designated as a guiding part in this application. The length of said region in the longitudinal direction of the threaded sleeve is, in particular, no more
20 than 15%, additionally preferred no more than 10%, of the length of the threaded sleeve.

A threaded sleeve is also designated as a bushing or a threaded bush.

25 The threaded sleeve is designed for screwing into the receiving opening of a workpiece. The receiving opening of the workpiece, into which the threaded sleeve is intended to be screwed, can be designed, for example, as a bore. In a preferred manner, in this case, the receiving opening of the
30 workpiece does not comprise any thread of its own. In particular, the workpiece comprises an inner wall which delimits the receiving opening. In a preferred manner, the inner wall of the workpiece is realized with a smooth wall.

35 When working with the threaded sleeve, the guiding part is conducted into the receiving opening first of all. As a result of the uniform contact between the three threads and the

workpiece, the threaded sleeve is no longer able to tilt sideways. As a result of screwing-in, i.e. rotation about the longitudinal axis of the threaded sleeve, the threaded sleeve is inserted into the receiving opening of a workpiece. When
5 screwing into a receiving opening, the thread of the threaded sleeve forms in particular a thread or rather counter thread in the (smooth-walled) inner wall of the receiving opening.

In principle, the threaded sleeve can be used for screwing
10 into the receiving opening of any type of workpiece.

The particularly effective cutting action of the present threaded sleeve is obtained, among other things, as a result of the very small flank angle of the thread profile, which is
15 in the range of 25° to 35° . The thread profile is the outline, formed in cross section, of a thread turn of the thread. The flank angle is to be understood as the angle which is enclosed by the flanks forming the thread profile.

20 A better cutting action for cutting into the, in a preferred manner smooth-walled, inner wall of the receiving piece defining the receiving opening is obtained as a result of choosing a small flank angle, resulting in a lower torque being required when screwing in the threaded sleeve. The
25 thread of the threaded profile does not displace, press or compact the material of the workpiece, but rather cuts it, sufficient stability of the flank angle having to be ensured so that the tensile load-carrying capacity continues to be maintained. As a result, the threaded sleeve is mounted
30 perpendicularly and the substantially lower forces on the surrounding material prevent deformation or rather destruction of the material. The reliable straight working allows for a receiving bore which is only insignificantly larger than the core diameter of the threaded sleeve and consequently allows
35 the outer thread to be inserted into the surrounding material in a deeper manner. All in all, the connection accordingly gains considerably more tensile strength. In addition, the screw-in resistance is reduced as a result of

the small flank angle such that the threaded sleeve is able to be installed in an easier manner, and consequently using simpler tools.

5 In addition, the thread of the threaded sleeve according to the invention is designed with three turns. In a preferred manner, the thread comprises three thread turns. In particular, the threaded sleeve comprises three thread starts in at least one end region of the threaded sleeve. Said thread
10 turns are mounted on the core of the threaded sleeve in particular at a radial spacing of 120° with respect to one another. In particular, the thread turns run over the entire length of the threaded sleeve equidistantly with respect to one another. Each thread turn runs in a preferred manner over
15 the same length of the threaded sleeve, said length being in a preferred manner a large part of the length, in particular substantially the entire length, of the threaded sleeve. The region of the guiding part on one end of the threaded sleeve can be left out so that the threaded sleeve is able to be
20 inserted easily.

As a result of the three-turn realization of the thread, the threaded sleeve can be screwed into workpieces in a particularly effective manner since as a result of the
25 considerably higher thread pitch of the thread turns - in relation to simply designed threads - the threaded sleeve is able to penetrate further into the workpiece per revolution. The processing speed of the threaded sleeve can be increased many times in this way.

30 In addition, the threaded sleeve according to the invention comprises a very large pitch, with an outer diameter of 8 mm to 14 mm it is in the range of 0.5 to 1.0 times the outer diameter of the threaded sleeve and with an outer diameter
35 greater than 14 mm to 40 mm, it is in the range of 0.25 to 0.65 times the outer diameter of the threaded sleeve. The term pitch is to be understood as the distance parallel to the longitudinal axis between the middle of two consecutive thread

turn portions of the same thread turn. By the thread being realized with three turns, said consecutive thread turn portions are not arranged adjacent to one another, as is the case with single-turn threads, but rather thread turn portions of the two other thread turns are located in between. The pitch is to be understood as the distance which the threaded sleeve rotates into a material with a single rotation of the same about 360° .

When dimensioning the thread pitch of threaded sleeves, care must basically be taken to ensure that they are to be dimensioned such that the acting pull-out forces do not result in the threaded sleeve being pulled rearward out of the workpiece again. At the same time, however, the size of the thread pitch has a decisive influence on the speed at which it can be mounted.

In addition, the thread depth of the thread profile is in the range of 0.03 times to 0.15 times the outer diameter of the threaded sleeve. The thread depth is to be understood, in this connection, as half the difference between the outer diameter of the threaded sleeve, which includes the thread, and the outer diameter of the core (without outer thread). In other words, the thread depth is the height of the thread profile.

Also relating to the thread depth, the threaded sleeve according to the invention strikes a balance between increasing the tensile strength of the connection between the threaded sleeve and the workpiece as a result of a particularly large thread depth and the damage which is caused to the material, in particular to a material produced from wood, by the penetration into the material.

The interaction between the values defining the threaded sleeve can ensure the connection between threaded sleeve and material has particularly increased tensile strength as the impairments or rather damage to the workpiece when the threaded sleeve is screwed-in are reduced.

In a preferred manner, the threaded sleeve comprises a cavity. In this case, the threaded sleeve includes, in particular, an inner wall which delimits the cavity of the threaded sleeve,
5 in particular in the radial direction of the threaded sleeve.

An internal thread which can extend along the entire cavity or only part thereof can be realized in the inner wall of the threaded sleeve. Said internal thread serves, in particular,
10 for receiving a complementary connecting element, for example a screw. Thus, the threaded sleeve itself is not a screw.

The cavity can extend along the entire length of the threaded sleeve or, however, can project into said threaded sleeve only
15 from one front end thereof. In a preferred manner, the cavity extends over at least the majority of the length of the threaded sleeve. In a preferred manner, the cavity is realized in a cylindrical manner.

20 The cavity comprises, in particular, two sub regions. A first sub region is realized in a preferred manner as a receiving region for a tool, in particular an Allen key, for screwing in the threaded sleeve. For this reason, the inner wall of the core, in a preferred manner, comprises notches which are
25 aligned parallel to the longitudinal axis and in which the tool can engage. A second sub region is realized in a preferred manner as a receiving region for a further connecting element, in particular a screw. In the second sub region, the threaded sleeve comprises, in particular, an
30 internal thread for screwing-in the connecting element.

In a preferred manner, the first sub region and the second sub region each comprise a length in the direction of the longitudinal direction of the threaded sleeve, the sum of the
35 lengths being substantially the length of the threaded sleeve. Thus, the sum of the lengths is at least 80%, additionally preferred at least 90%, of the length of the threaded sleeve. In particular, the cavity consists exclusively of the two sub

regions.

Additionally preferred, the threaded sleeve is tapered at at least one of its axial ends, in a preferred manner at both
5 ends. In this case, the tapering region is at an angle of 45° to a longitudinal direction of the threaded sleeve.

With an outer diameter of 8 mm to 14 mm, the pitch of the thread, in a preferred manner, is in the range of 0.53 times
10 to 0.94 times the outer diameter of the threaded sleeve and with an outer diameter greater than 14 mm to 40 mm is in the range of 0.37 times to 0.65 times the outer diameter of the threaded sleeve.

15 Additionally preferred, the thread depth over the entire range of the outer diameter, i.e. from 8 mm to 40 mm, is in the range of 0.04375 times to 0.125 times the outer diameter of the threaded sleeve.

20 In a preferred manner, the flank angle is in the range of 28° to 32° , particular preferred in the range of 29° to 31° and even more preferred is precisely 30° .

In particular, the above-mentioned particularly preferred
25 value ranges achieve a connection between threaded sleeve and workpiece with extraordinarily good tensile strength.

In a preferred manner, the ratio of thread depth to pitch of the thread is in the range of 0.1 to 0.20, preferably 0.11 to
30 0.17, over the entire range of the outer diameter. A particularly good tensile strength is able to be achieved by choosing such a ratio.

In particular, the thread profile does not have any curvature,
35 in particular in a region of the thread profile facing away from the core. The region of the thread facing away from the core is the region of the thread which is at the furthest spacing from the core. The thread profile can have a curvature

in a region which is arranged in the immediate vicinity of the core. The transition of the thread to the core can thus be curved. The profile of the thread is, in particular, not realized as a round thread. In a preferred manner, the entire
5 thread profile does not have a curvature such that the flanks, in particular, are planar. A particularly good cutting action of the threaded sleeve is achieved as a result.

Additionally preferred, the thread profile is substantially
10 formed pointed. In particular, the flanks of the thread form substantially a point at the point of the thread profile spaced furthest away from the core. Due to the manufacturing process, a perfectly pointed thread profile cannot always be ensured. A plateau, which runs substantially parallel to the
15 core of the threaded sleeve, can be created between the ends of the thread flanks facing away from the core. Said plateau should, however, be no more than only 10%, in a preferred manner no more than 5% and additionally preferred only 3%, of the distance which the flanks enclose between their ends
20 facing the core so that a substantially pointed profile is provided.

In addition, it is preferred for the flank angle to be constant along the entire thread depth. This is the case when
25 the flanks of the thread in the thread profile have neither kinks nor roundings but rather can be described in each case by a straight line with a constant straight-line pitch.

In a particularly preferred manner, the threaded sleeve
30 according to the invention is designed for screwing into a workpiece of wood. With the threaded sleeve in the screwed-in state, the threaded sleeve and the piece of wood form, in particular, a common system.

35 It is particularly advantageous that the threaded sleeve according to the invention does not compact or press the wood or rather the cell structure of the wood, but instead only cuts it. This results in considerably increased tensile

strength between the threaded sleeve and the workpiece of wood. Said effect is strengthened further by the structure of the wood. Fundamentally, wood has higher tensile strength in the longitudinal direction of the growth rings than in the cross direction as the different growth rings have different material characteristics and connections with lower load-bearing capacity often exist between individual growth rings. If the wood or rather the cell structure thereof is pressed and consequently destroyed when a threaded sleeve is inserted, the cohesion between the individual growth rings is reduced further and the tensile strength between the threaded sleeve and the wood workpiece is reduced.

In a preferred manner, the core of the threaded sleeve has substantially a consistently constant diameter. In this connection, both the outer diameter and the inner diameter of the core, which at the same time is the diameter of the cavity of the core (screw receiving opening), can be realized in a consistently constant manner.

In a particularly preferred manner, the threaded sleeve according to the invention is realized from metal materials, but can also be realized in plastics material, in particular synthetic fiber material.

A preferred embodiment of the invention is shown in the figures, in which:

- fig. 1: shows a schematic representation of a side view and of a longitudinal section of a threaded sleeve according to the invention; and

- fig. 2: shows a schematic representation of a top view of a threaded sleeve according to fig. 1.

Fig. 1 shows a side view and a longitudinal section of a threaded sleeve 100 according to the invention of the length 24 including a cylindrical core 10 and a thread 11 mounted

outside on the core 10. The bottom half of fig. 1 shows a section along the longitudinal axis 12 of the threaded sleeve 100, whilst a side view of the threaded sleeve 100 can be seen in the top half.

5

The thread 11 of the threaded sleeve 100 is realized with three turns and consequently comprises three thread turns 20, 22, 22. It can be seen in the upper half of the figure how the three thread turns 20, 21, 22 of the three-turn thread 11 develop in a helical manner about the core 10 from the one end 13b to the other end 13a of the threaded sleeve 100. In this case, a region, the so-called guiding part 25, along the length 26 at the end 13b of the threaded sleeve 100 is left out. Said thread-free region 25 along the length 26 serves for inserting, in a perpendicular guided manner, the threaded sleeve 100 into a receiving opening (not shown here) into which the threaded sleeve 100 is screwed. It can also be seen that the threaded sleeve 100 is tapered conically at its two ends 13a, 13b.

20

It can be seen in the bottom half of the figure that the depicted threaded sleeve 100 comprises as a cylindrical cavity 14 which extends from the one axial end 13a of the threaded sleeve 100 to the other axial end 13b of the threaded sleeve 100. The length 27 of the cavity 14 thus corresponds to the length 24 of the threaded sleeve 100.

25

The cavity 14 comprises two sub regions 14a, 14b, a first sub region 14a and a second sub region 14b which directly follow one another in the longitudinal direction 12 of the threaded sleeve 100. The first sub region 14a extends along the length 28 proceeding from the end 13a of the threaded sleeve 100, whilst the second sub region 14b comprises the length 29. As the first sub region 14a and the second sub region 14b follow one another directly, the sum of the lengths 28 and 29 corresponds to the length 24 of the threaded sleeve 100.

30

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In the first sub region 14a, the cavity 14 is realized as a

receiving region for a tool (not shown here) for screwing-in the threaded sleeve 100. The core 10 of the threaded sleeve 100 comprises an inner wall 35. Notches, which are aligned in a manner parallel to the longitudinal axis and in which the tool can engage, are realized in the inner wall 35 of the core 10. The first sub region 14a of the cavity 14, which is realized as a receiving region for a tool, is realized here for receiving an Allen key (not shown here).

The cavity 14 is realized in the second sub region 14b as a receiving region for a further connecting element (not shown here), in this case a screw. For this reason, the threaded sleeve 100 from fig. 1 comprises an internal thread 16 for screwing-in the connecting element.

In the first sub region 14a of the cavity 14, the internal thread 16 has been dispensed with as a result of producing the receiving region with the notches 15. In the sub region 14b, along the length 29, the internal thread 16 is present undiminished. The undiminished internal thread 16 is not identified as the thread 11, mounted on the outside, by a thread profile 17, but rather by the delimiting of a rectangle with the length 29 as a long side and the thread depth of the internal thread as a short side.

The thread profile 17 of the three thread turns 20, 21, 22, which are each realized in the same manner, can be seen with their characteristic variables in the longitudinal section in fig. 1.

The thread depth 30 is half the difference between the outer diameter 32 of the threaded sleeve 100 and the outer diameter 33 of the core 10. The thread pitch 30 provides the distance, parallel to the longitudinal axis, between the centers of consecutive thread turn portions 20a, 20b of the same thread turn 20.

In said exemplary embodiment, the two marked flanks 18 and 19

of the thread profile 17 form an isosceles triangle, the flank angle being 30° . The region 23 of the thread profile 17 furthest away from the core 10 is realized as a point 36 by the consistently straight-line form of the flanks 18 and 19.

5

Fig. 2 shows a top view of the end 13a of the threaded sleeve 100 according to the invention in fig. 1.

It is possible to see the first sub region 14a of the cavity from fig. 1 which is realized as a hexagonal receiving region and is suitable for receiving a special Allen key (not shown here). Whilst the threaded sleeve 100 comprises an outer diameter 32, the core 10 of the threaded sleeve 100 has a smaller outer diameter 33. The internal thread 16 of the threaded sleeve 100 comprises the outer diameter 34.

Figure 2 also shows the three thread turns 20, 21, 22 of the thread 11. The three thread turns 20, 21, 22 extend in a helical manner from the end 13b of the threaded sleeve 100 to the oppositely situated end 13a, apart from the thread-free region 25 along the length 26 proceeding from the end 13b. Consequently, above all, it is possible to see in figure 2 the thread starts 20g, 21h, 22h of the three thread turns 20, 21, 22. The radial distance 37 of the thread turns 20, 21, 22 is 120° . The thread turns 20, 21, 22 are consequently arranged equidistantly with respect to one another.

In a preferred embodiment, the threaded sleeves according to the invention include an outer diameter 32 of 8 mm to 40 mm with a pitch 31 in a range of between 6 mm and 15 mm and a thread depth 30 in a range of between 1 mm and 1.75 mm.

The following combinations of the features of the thread 11 or rather of the thread profile 17 are particularly preferred:

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- with an outer diameter 32 of the threaded sleeve 100 of 8 mm:
 - o pitch 31 = 6 mm to 7.5 mm

- thread depth 30 = 1 mm
- with an outer diameter 32 of the threaded sleeve 100 of 10 mm:
- pitch 31 = 6 mm to 7.5 mm
- 5 ○ thread depth 30 = 1.25 mm
- with an outer diameter 32 of the threaded sleeve 100 of 12 mm to 14 mm:
- pitch = 7.5 mm
- thread depth = 1.25 mm
- 10 ● with an outer diameter 32 of the threaded sleeve 100 of 16 mm:
- pitch = 9 mm
- thread depth = 1.5 mm
- with an outer diameter 32 of 18.5 mm to 22 mm:
- 15 ○ pitch 31 = 12 mm
- thread depth 30 = 1.5 mm
- with an outer diameter 32 of the threaded sleeve 100 of 25 mm to 40 mm:
- pitch 31 = 15 mm
- 20 ○ thread depth 30 = 1.75 mm.

List of references

	100	Threaded sleeve
5	10	Core
	11	Thread
	12	Longitudinal axis of the threaded sleeve
	13a,13b	Ends of the threaded sleeve
	14	Cavity
10	14a	First sub region of the cavity
	14b	Second sub region of the cavity
	15	Notches
	16	Internal thread
	17	Thread profile
15	18,19	Flanks of the threaded profile
	20,21,22	Thread turns
	20a,20b	Thread turn portions
	20g,21g,22g	Thread starts
20	23	Region of the thread profile furthest away from the core
	24	Length of the threaded sleeve
	25	Thread-free region at the end 13b of the threaded sleeve
25	26	Length of the thread-free region
	27	Length of the cavity
	28	Length of the first sub region
	29	Length of the second sub region
30	30	Thread depth
	31	Thread pitch
	32	Outer diameter of the threaded sleeve
	33	Outer diameter of the core
	34	Outer diameter of the internal thread of the
35	threaded sleeve	
	35	Inner wall of the core
	36	Point of the thread profile
	37	Radial distance of the thread turns

38 Flank angle

Patentkrav

1. Gevindbøsning (100) til iskruning i en optageåbning i et emne, med en kerne (10) og et gevind (11), der er anbragt
5 udvendigt på kernen (10), kendetegnet ved,
- at gevindet (11) omfatter tre skruegange (20, 21, 22),
 - at skruegangene (20, 21, 22) har et gevindprofil (17),
 - at gevindprofilet (17) har en flankevinkel (38) på 25° til 35° ,
 - 10 • at gevindets (11) stigning (31) ved en udvendig diameter på 8 mm til 14 mm udgør 0,5 til 1,0 gange og ved en udvendig diameter større end 14 mm til 40 mm 0,25 til 0,65 gange gevindbøsningens (100) udvendige diameter (32), og
 - at gevindprofilets (17) gevinddybde (30) udgør 0,03 til 0,15
15 gange gevindbøsningens (100) udvendige diameter (32).
2. Gevindbøsning (100) ifølge krav 1, kendetegnet ved,
at gevindets (11) stigning (31) ved en udvendig diameter på
20 8 mm til 14 mm udgør 0,53 til 0,94 gange gevindbøsningens (100) udvendige diameter (32) og ved en udvendig diameter større end 14 mm til 40 mm 0,37 til 0,65 gange gevindbøsningens (100) udvendige diameter (32).
- 25 3. Gevindbøsning (100) ifølge et af de foregående krav, kendetegnet ved,
at gevinddybden (30) udgør 0,04375 til 0,125 gange gevindbøsningens (100) udvendige diameter (32).
- 30 4. Gevindbøsning (100) ifølge et af de foregående krav, kendetegnet ved,
at flankevinklen (38) udgør 28° til 32° , foretrukket 29° til 31° , særligt foretrukket 30° .
- 35 5. Gevindbøsning (100) ifølge et af de foregående krav, kendetegnet ved,
- at forholdet mellem gevinddybden (30) (20, 21, 22) og gevindets (11) stigning (31) udgør 0,1 til 0,20, foretrukket

0,11 til 0,17.

6. Gevindbøsning (100) ifølge et af de foregående krav,
kendetegnet ved,

5 at gevindprofilet (17) ikke har nogen krumning, især i et fra
kernen (10) bortvendt område (23) af gevindprofilet.

7. Gevindbøsning (100) ifølge et af de foregående krav,
kendetegnet ved,

10 at gevindprofilet (17) er udformet i det væsentlige spidst.

8. Gevindbøsning (100) ifølge et af de foregående krav,
kendetegnet ved, at flankevinklen (38) er konstant langs hele
gevinddybden (30).

15

9. Gevindbøsning (100) ifølge et af de foregående krav,
kendetegnet ved,

at gevindbøsningen (100) er udformet til iskruning i et emne
af træ.

20

10. Gevindbøsning (100) ifølge et af de foregående krav,
kendetegnet ved,

at gevindbøsningens (100) kerne (10) har en konstant diameter
(33).

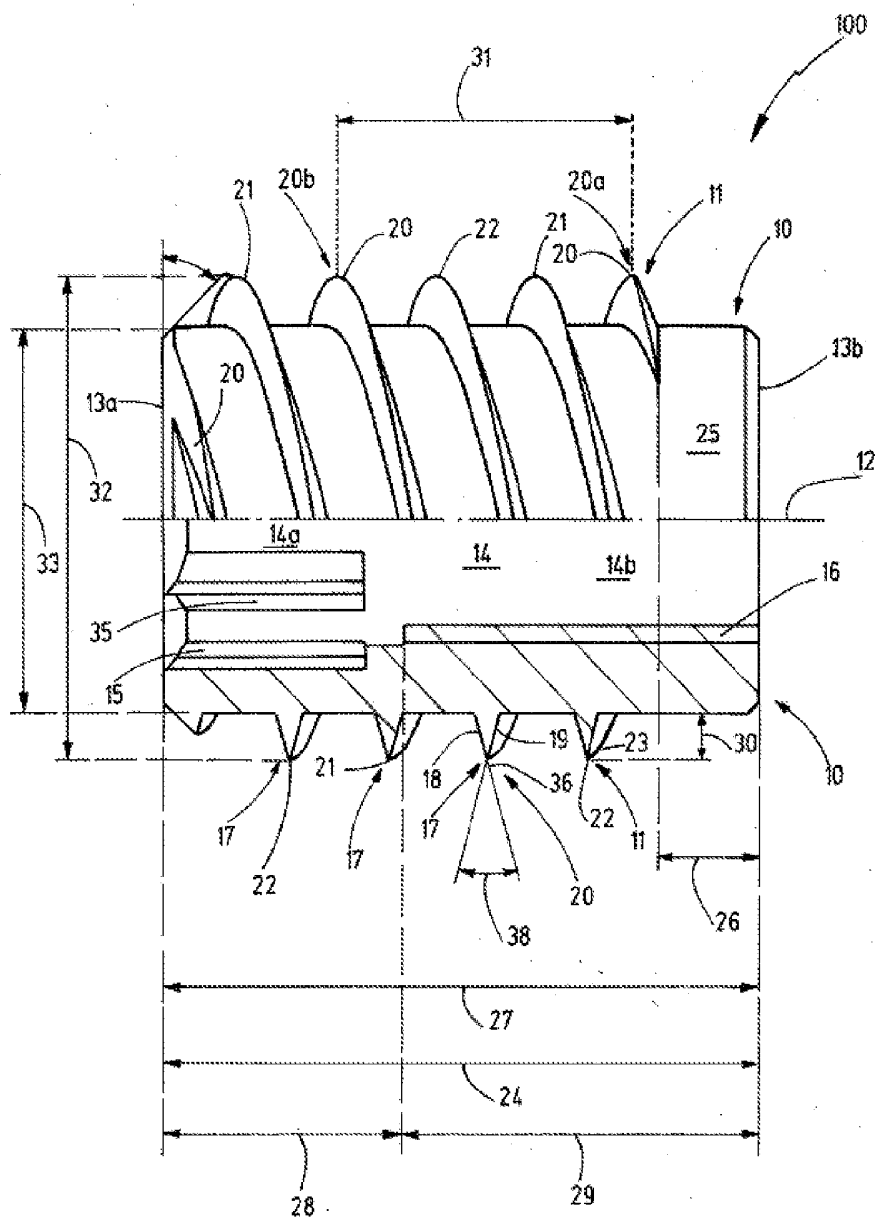


Fig.1

