

Two-Part Protector for a Pipe End  
Which is Provided with an External or Internal Thread

The invention concerns a two-part protector according to the preamble of claim 1.

5 The invention concerns moreover a method for producing such a protector according to the preambles of claims 13 and 14. Such protectors are used in particular for transporting and storing pipes with threads and other sensitive couplings at the pipe ends. Primarily, pipes for drill strings are to be protected with respect to tough manipulation and storage conditions at their sensitive thread areas. The threads can  
10 be external threads but also, for example, in case of the ends of socket pipes, internal threads. Both must be protected from damage, deformations, and soiling.

As an immediate cover of such a threads primarily threaded parts of plastic material are suitable that, with regard to their manufacture, can be easily adjusted to different  
15 threads and primarily in case of impacts at the ends are less hard and also less strong compared to the threads of the pipes so that they absorb loads and do not transmit them onto the threaded part. This is an immediate protective thread cover. However, in order for such protectors to be able to withstand also severe loads, such protectors are often additionally provided with a cylindrical sleeve of metal, preferably  
20 steel, that for protecting an external thread are arranged so as to surround the threaded part of plastic material or, for protecting an internal thread, cover the internal side of the threaded part of plastic material. In both cases the threaded part with its leading end (thread side) contacts the thread and at its rear is supported by the metal sleeve. Both parts of the protector are coupled lockingly in a well-known  
25 way. However, in this connection the problem is often encountered that the much harder and stronger metal sleeve damages integrally formed locking projections on the threaded parts. As a result of this and also because of precautionary tolerances in regard to the seat of the locking means there is the risk that the sleeve relative to the threaded part will become detached or as a result of movement play during  
30 transport damage is caused on the threaded part made of plastics. The locking seat

between sleeve and threaded part must be ensured even under extreme temperatures wherein in particular the different thermal expansion of metal (steel) and plastic material (threaded part) especially causes difficulties. Problems with the proper locking seat between threaded part and sleeve also have an effect on the possibility of unscrewing the protector from the thread or screwing it again onto the thread when the screwing action is realized through the metal sleeve.

Object of the invention is therefore to provide a two-part protector where the sleeve and the threaded part can be plugged into one another fixedly and with little play without the threaded part becoming damaged in the process and in which also an excellent connection between sleeve and threaded part ensures a problem-free manipulation when screwing on or unscrewing it, even in case of use under extreme temperature conditions.

According to the invention this object is solved by a two-part protector according to the preamble of claim 1 in that the sleeve, with a terminal edge that is leading when realizing the locking action, is pressed at least near the locking recesses tightly against the threaded part.

Especially in the area of the locking recesses it is important that the sleeve rests tightly against the threaded part in order to prevent any detaching movement and also to provide an excellent seat when rotary movements are performed. This is achieved preferably in that the sleeve is first pushed on with a slanted terminal edge and then is subsequently shaped behind the locking recesses so as to be in tight contact.

It is understood that the area of locking recesses in this regard is particularly important so that the tight contact can be limited to circumferential areas near the locking means. In general, the tight contact is provided uniformly about the entire leading terminal edge in order to avoid even local play or locally freely projecting edges.

It is particularly advantageous when the sleeve is cup-shaped which provides by means of a bottom of the cup a closure of the pipe opening, prevents engagement of coarse tools such as lifting tools, and can be produced easily with regard to manufacturing technology even for injection-molded plastic parts.

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The sleeve can have at its end that is trailing when realizing the locking action a rolled edge that engages across the rear edge of the threaded part and thus also provides an edge protection. Moreover, interlocking can be provided at the rolled edge in order to provide an anti-rotation securing means that secures the threaded  
10 part and the sleeve relative to one another in the rotational direction and prevents loading of the locking projections and locking recesses when the protector is loaded rotationally so that the locking means remain free of load.

The corresponding deformation of the terminal edge can be realized with the method  
15 according to the invention by means of a shaping die that is preferably cylindrical. Also, the sleeve can be designed at the trailing end with projections that, upon forming to produce the rolled edge, serve as interlocking means by engaging receptacles in the threaded part.

20 Embodiments of the invention are illustrated in the drawing and will be explained in the following in more detail. The drawing shows in:

- |           |                                                                                       |
|-----------|---------------------------------------------------------------------------------------|
| Fig. 1    | a stamped sheet metal for producing a metal sleeve for a protector,                   |
| Fig. 2    | a metal sleeve for a protector for an external thread,                                |
| 25 Fig. 3 | metal sleeve according to Fig. 2 with shaping tool,                                   |
| Fig. 4    | a modified embodiment of the metal sleeve of Figs. 2 and 3 with modified rolled edge, |
| Fig. 5    | a threaded part of a protector,                                                       |
| Fig. 6    | a protector with threaded part and metal sleeve,                                      |
| 30 Fig. 7 | protector according to Fig. 6 with a shaping tool,                                    |
| Fig. 8    | another embodiment of a protector,                                                    |
| Fig. 9    | a stamped sheet metal for producing a metal sleeve for a protector for                |

- an internal thread,
- Fig. 10 metal sleeve for a protector for an internal thread,
- Fig. 11 protector according to Fig. 10 with shaping tool,
- Fig. 12 detail of a metal sleeve of a further embodiment,
- 5 Fig. 13 threaded part for a protector for an internal thread,
- Fig. 14 protector for an internal thread,
- Fig. 15 protector according to Fig. 14 with a shaping tool,
- Figs. 16, 17 views of a metal sleeve for a protector for an internal thread,
- and 18
- 10 Figs. 19, 20 a further embodiment of a metal sleeve for a protector for an
- and 21 internal thread.

A stamped sheet metal of steel identified in Fig. 1 as a whole by 1 of substantially rectangular contour has inwardly positioned cutouts 2 and downwardly projecting

15 projections 3. Such a stamped sheet metal is bent transversely to its length to a ring and butt-welded at the abutting edges 4, 5 and rolled inwardly at the bottom edge 6 so that a sleeve 7 according to Fig. 2 results. The sleeve is initially cylindrical at the terminal edge 8 neighboring the cutouts in accordance with the remainder of the sleeve. A rolled edge 9 formed on the opposite end continues its curved shape into

20 the projections 3.

It should be noted that Fig. 2 does not show a (symmetric) diametral section of the sleeve but in one half a developed section plane. Indeed, the four cutouts 2 and also the projections 3 are distributed uniformly about the circumference at a

25 circumferential angle of 90°, respectively, relative to one another, wherein the section line of the illustration is however not placed on the left side of Fig. 2 through a cutout 2 and a projection but instead adjacent thereto.

In Fig. 3 a further shaping of the sleeve 7 is illustrated; the sleeve is provided

30 between the cutouts 2 and the leading terminal edge 8 with a conical widened section 10 by means of a die-like cylindrical shaping tool 11 that is forced axially from above into the sleeve and widens the terminal edge 8.

The rolled edge 9 remains unchanged in the process. In Fig. 4 an alternative rolled edge 12 is illustrated for a sleeve that otherwise corresponds to the sleeve 7; this sleeve has a reduced deformation and can be produced more easily. However, like the rolled edge 9 it provides a circumferentially extending rounded edge 13 for a robust sleeve that is configured to be impact-proof with regard to axial as well as radial loads. The rolled edge 12 can be provided with projections that correspond to the projections 3.

In Fig. 5, the threaded part 14 of plastic material to match the sleeve 7 is illustrated; it is configured with a cylindrical wall 15 and a bottom 16 in a cup shape in order to cover a pipe end radially as well as axially. It is provided on an internal circumferential wall 17 with a cut thread that is to be screwed onto an external thread of a pipe to be protected. The threaded part has projections 18 that match the cutouts 2 of the sleeve 7. At the upper edge above the projections 18 a circumferentially extending rim 19 is formed that conically tapers toward the end. Moreover, receptacles 20 are formed in the threaded part, produced by an injection-molding process, and are designed for engagement by the projections 3.

The threaded part 14 with regard to its external shape is slightly conical so that it tapers slightly toward the edge that is neighboring the receptacles 20; this is beneficial for easy removal from the mold in injection molding processing. On a correspondingly slightly conical external wall surface 21, longitudinal ribs 22 are however formed that, with their external edges, cancel the conical shape and define a cylindrical external envelope for receiving the cylindrical sleeve. The ribs 22 moreover provide a handling means for a situation where the threaded part 14 is to be used as a single-part protector without sleeve. In this case, the ribs 22 are positioned externally and serve as an attack structure for screwing on or unscrewing the protector by hand or with tools.

In Fig. 6 a two-part protector 23 is illustrated that is comprised of the threaded part 14 and a sleeve 7. By coaxial insertion wherein the sleeve glides without play along the

external edges of the ribs 22, the leading terminal edge 8 of the sleeve 7 has also passed with its forwardly widening shape the locking projections 18 that, in turn, are provided with slanted ramp surfaces. The projections 3 of the sleeve have also reached the matching receptacles of the threaded part 14. As shown in the drawing,  
5 the projections 3 have within the receptacles in the circumferential direction a reduced play in comparison to the play of the locking projections 18 in the cutouts 2 so that the threaded part 14 when rotating the sleeve 7 is entrained only by the projections 3 while the locking projections 18 are not loaded.

10 A very important final shaping process by means of a tool 24, designed, like the tool 11, as a cylindrical die but acting by radial compression from the exterior, causes shaping of the edge 10 of the sleeve 7 to tightly contact the conical area 19 of the threaded part 14 so that the external edge is pushed in; especially, the sleeve 7 and the threaded part 14 rest against one another without play wherein also the locking  
15 means ensure a more stable connection by a firmer engagement of the locking projections 18 at the edges of the locking recesses. In this regard, especially important for this deformation is the tight contact of the sleeve 7 near the locking cutouts 2.

20 Fig. 8 shows an embodiment of a protector as an alternative to that of Fig. 7 whose sleeve 25 is embodied in accordance with sleeve 7 but has at its trailing end only a 90° rolled structure according to the rolled edge 12 of Fig. 4. This embodiment can also be designed with an anti-rotation securing means in the form of projections 26 and receptacles 27 without loading the locking means.

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In Figs. 9 to 21 protectors for internal threads are illustrated as counter parts to the protectors for external threads according to Figs. 1 to 8.

In Fig. 9 an elongate rectangular stamped sheet metal 30 is illustrated as a  
30 preproduct and has cutouts 31 for locking and projections 32 for designing an anti-rotation interlocking means and, according to Fig. 10, can be bent to a ring shape and welded so that a sleeve 33 is formed that has locking cutouts 31 uniformly

distributed in the circumferential direction and at its rear edge 34 is provided with a rolled edge 35, wherein the rolled edge, in contrast to the afore described embodiment of sleeve 7, is shaped to extend outwardly. This sleeve 33 that is cylindrical with the exception of the rolled edge is shaped by means of an axially advanced die-like and substantially cylindrical shaping tool 36 by means of conical shaping surfaces 37 along a leading terminal edge 38 so as to taper forwardly.

Fig. 12 illustrates in detail a simplified shape of a rolled edge 39 with less curving that is oriented flange-like outwardly but can still have projections serving for interlocking.

The threaded part 40 matching the sleeve 33 is illustrated in Fig. 13. This threaded part has an external surface that tapers slightly conically in the upward direction and has thread 41 cut into it. The threaded part 40 is completed to a cup shape by means of a bottom 42. On the one hand, on the internal side locking projections 43 with slanted ramp surfaces are provided at the leading side for insertion into a sleeve and, on the other hand, receptacles 44 for locking and meshing with the sleeve 33 are provided; they are shown in section in Fig. 14. The rolled edge 35 of the sleeve 33 covers an outwardly projecting terminal area 45 of the threaded part 40 that serves, when screwing on the threaded part, as a point of attack for a hand or a tool but also provides protection with regard to impacts. In this embodiment, the receptacles 44 are also configured relative to the projections 32 with minimal oversize in the circumferential direction in comparison to the locking projections 43 relative to the locking recesses 31. This protects the locking means upon rotational loads on the sleeve from damage and stress.

As shown in Fig. 14, the leading edge 38 of the sleeve with the adjoining conical area, that has been helpful and gentle with regard to the locking action when inserting sleeve and threaded part into one another, now projects in a way that would appear to cause play or enable the sleeve to drop out when the sleeve is contacted by a tool in case the protector identified by 46 is subjected to tough use.

This is counteracted according to Fig. 15 by means of a die-like tool 47 whose conical head part 40 penetrates into the sleeve and reshapes the leading edge to a

cylindrical shape so that the leading edge will contact fixedly and tightly the internal wall of the threaded part 40 and securely engages the locking projections 43. It is understood that by means of a multi-part tool also a spreading movement going beyond this is possible that widens the sleeve at the leading edge 38 to a cone shape that is in even tighter contact.

Figs. 16, 17, and 18 show in different views a sleeve with a rolled edge 39 in accordance with Fig. 12 that is thus only widened to a flange and that, in the present case, also has no projections. In case of flat contacting of a sleeve on a threaded part such projections are not necessary because in such an embodiment attack possibilities for introducing torque through the sleeve 50 are hardly possible.

A preferred sleeve according to Figs. 19 to 21 is illustrated by sleeve 33 that provides an excellent protection of the threaded part as well as an anti-rotation connection between sleeve and threaded part without causing loading of the locking means with a rolled edge 35 that as such is bent by more than 180° and with regard to the projections bent even farther.

The illustrated embodiments of protectors for external and internal threads are robust and moreover can be produced in an extremely simple way even though the materials to be joined with regard to strength, hardness, and in particular also their thermal expansion coefficients are very different. Especially the thermal expansion of the materials of different magnitude entails the risk of disassembly of two-part protectors when this is not counteracted by special measures by way of shaping the sleeve onto the threaded part in the leading terminal edge area and by way of interlocking means preventing rotational movements.

## Claims

1. Two-part protector (23, 43) for a pipe end provided with an external thread or internal thread, wherein a substantially cylindrical thread part (14, 40) of plastic  
5 material covers the thread of the pipe end and a sleeve (7, 33) of metal that is also substantially cylindrical supports the threaded part (14, 40) rearwardly and wherein the threaded part (14, 40) and the sleeve (7, 33) engage one another lockingly by locking projections (18, 43) and locking cutouts (2, 31), characterized in that the sleeve (7, 33), with a terminal edge (8, 38) that is leading when realizing the locking  
10 action, is pressed at least near the locking recesses (2, 31) tightly against the threaded part (14, 40).
2. Protector according to claim 1, characterized in that the threaded part (14, 40) is cup-shaped.
- 15 3. Protector according to claim 1 or 2, characterized in that the sleeve (7, 33) is shaped at a terminal edge that is trailing when realizing the locking action to a rolled edge (9, 12, 35, 39) that engages across a rear edge of the threaded part (14, 40).
- 20 4. Protector according to claim 3, characterized in that the rolled edge (9, 35) forms together with the rear edge of the threaded part (14, 40) a form-locking interlocking means as an anti-rotation securing means.
- 25 5. Protector according to claim 4, characterized in that the rolled edge (9, 35) has projections (3, 32) for providing the interlocking means with which it engages receptacles (20, 44) of the threaded part (14, 40).
6. Protector according to claim 3, 4, or 5, characterized in that the rolled edge (9, 35) in cross-section is shaped as an arc of at least 90 E.
- 30 7. Protector according to one of claims 4 to 6, characterized in that the locking projections (18, 43) and the locking cutouts (2, 31) are provided with greater play

relative to one another in the circumferential direction than the interlocking means (3, 32; 20, 44) on the rolled edge (9, 35).

8. Protector according to one of claims 1 to 7, characterized in that the locking  
5 projections (18, 43) are formed on the threaded part (14, 40) and form a slanted ramp surface for the sleeve (7, 33) during the locking action.

9. Protector according to one of claims 1 to 8, characterized in that as a protector  
(43) for an internal thread it is provided with a terminal rotary flange (45) that projects  
10 outwardly past a thread area (41).

10. Protector according to one of claims 1 to 8, characterized in that as a protector  
(23) for an external thread it has an external surface provided with longitudinal ribs  
(22)

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11. Method for producing a two-part protector (23, 43) according to one of the claims  
1 to 10, in which a cylindrical sleeve (7, 33) of metal is manufactured with locking  
cutouts (2, 31) and is moved coaxially into a threaded part (14, 40) injection-molded  
from plastic material until locking relative to one another occurs, characterized in that  
20 the sleeve (7, 33), before the locking action, is shaped at a leading edge at least near  
locking cutouts (2, 31) so as to project slantedly relative to the threaded part (14, 40)  
and, after the locking action, is pressed tightly against the threaded part (14, 40).

12. Method according to claim 11, characterized in that the shaping of the terminal  
25 edge is realized before the locking action is realized by means of an axially supplied  
shaping die (11, 36).

13. Method according to claim 11 or 12 for producing a protector (23) for an external  
thread, characterized in that the shaping of the terminal edge after the locking action  
30 is realized by means of a shaping die (24).

14. Method for producing a protector according to one of claims 4 to 7, in which a

cylindrical sleeve (7, 33) of metal is manufactured with locking cutouts and is inserted coaxially into a threaded part (14, 40) made by injection molding from plastic material until locking occurs, characterized in that the sleeve (7, 33) at a trailing edge is provided with projections (3, 32) and in that the trailing edge is shaped to a rolled  
5 edge (9, 35), on which the projections (3, 32) are facing the threaded part (14, 40) for the purpose of interlocking.