

Description

Title of Invention: END PROTECTOR FOR A TUBULAR ELEMENT

Technical Field

5 [0001] The present invention relates to an end protector designed for mounting on a tubular element. More particularly, the end protector having a side portion, a closed bottom end, and an open top end. The bottom end faces the tubular element when the end protector is mounted, and the top end is enclosed with a peripheral brim along the side portion.

10 Background Art

[0002] It is well known that the ends of pipes or other tubular elements need to be protected from weather conditions, substances and/or for many other reasons. For example, end caps are commonly used to protect the threads of threaded pipe ends, such as those found in drill pipes. These end caps can be designed as external caps
15 for pipes with external threads, or as plugs that are inserted into the pipe ends.

[0003] End protectors are manufactured in a wide range of sizes and shapes to suit various types of pipes. During the production of pipes, the pipes may have a maximum inner diameter and minimum inner diameter, and the thickness of the pipe walls can also vary. This means that the measurement of the opening in the pipe, where the end protector is to be inserted, can also differ. Typically, the end protector
20 is made to fit the minimum inner diameter of the pipe. This ensures that the end protector can be easily inserted into the pipe due to the matching size between the protector and the pipe.

[0004] US Patent No. US2709456A discloses a thread protector that can be quickly
25 and easily applied to the ends of threaded pipes. This thread protector is designed to shield the threads from impacts and foreign debris that could otherwise cause damage or clogging. The thread protector consists of an annular sleeve portion and a second sleeve or liner made of non-metallic sheet material. These components are joined together by folds or gathers, which form a connecting interlock. The sleeve
30 portion has elastic characteristics that allow it to contract circumferentially when inserted into internal threads, ensuring a secure fit.

[0005] **Japanese Patent No. JPH11182777A** discloses a protective device for a pipe opening bevel. The device includes a bevel guard with a vertically split slit located at one circumferential point of an annular body. This body can be attached to the end face and inner surface of a pipe. The annular body features a wedge receiver, formed by turning up the end parts of the annular body that face each other at the slit. A wedge, with an angular cross-section, is positioned inward of the pipe and driven along the wedge receiver. This action causes the body to expand, providing a protective effect.

[0006] UK Patent No. GB1079316A discloses a pipe end protecting device comprising a ring portion, the peripheral wall of which has an even thickness along its entire length and tapers outwardly in the axial direction from one end to the other. As a result, the diameter of the ring portion progressively increases from one end to the other. It also features an outwardly extending flange at the smaller diameter end of the ring portion, a bevel at the larger diameter end, and a slit that extends axially through both. Despite the existing solutions for protecting the ends of tubular elements, there remains a need for further improvements within this technology. Specifically, there is a need for an end protector that is reliable, adaptable to various diameters, simple to use, and can be manufactured at a low cost.

[0007] Despite the existing solutions for protecting the ends of tubular elements, there remains a need for further improvements within this technology. Specifically, there is a need for an end protector that is reliable, adaptable to various diameters, simple to use, and can be manufactured at a low cost.

Summary of Invention

[0008] Aspects of the present invention provide an improved end protector designed to address the drawbacks of known devices in this field

[0009] One aspect of the present invention provides an end protector for mounting on a tubular element. The end protector is having a side portion, a closed bottom end portion, and an open top end. The bottom end faces the tubular element when

mounted, and the top end is enclosed by a peripheral brim along the side portion. The side portion includes at least one longitudinal slit extending from the top end to the bottom end portion and is formed by at least one connecting element that extends at least partially into the interior of the side portion, connecting the side
5 portion on both sides of the slit.

[0010] In one aspect of the present invention, the brim includes one or more U or V-shaped cut-outs and corresponding U- or V-shaped elevation portions. As the walls of the slits move towards each other, the sides of the cut-outs or elevations will also move towards each other, allowing the end protector to adapt to the pipe opening.
10 This design minimizes bulging in the brim.

[0011] In one aspect of the present invention, the U- or V-shaped cut-outs on the brim positioned generally aligned with the slit and the connecting element.

[0012] In one aspect of the present invention, the U- or V-shaped cut-outs prevent the brim from wavering when the end protector is in use.

15 [0013] In another aspect of the present invention, the closed bottom end portion features a plurality of grooves and elevations. As the walls of the slits move towards each other, the opposite walls of the elevations on the bottom end portion also move towards each other, thereby reducing the likelihood of the bottom end portion surging.

20 [0014] An advantage of the present invention is that the end protector can be easily mounted in pipes with varying opening sizes.

[0015] Another advantage of the present invention is that the end protector securely fits in pipes or tubular elements.

25 [0016] One more advantage of the present invention is that the end protector can be manufactured at a low cost.

[0017] Further details and specification of the invention are described in the detailed description and accompanying figures, providing comprehensive insights into the operation and functionalities of the present invention.

Brief Description of Drawings

[0018] The foregoing aspects and many of the advantages of the present invention will be more appreciated and better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

- 5 [0019] **Fig. 1** shows the end protector in a perspective view, as seen from above, according to an embodiment of the invention;

[0020] **Fig. 2** shows the end protector in another perspective view, as seen from above, according to an embodiment of the present invention;

[0021] **Fig. 3** shows a top view of the end protector;

- 10 [0022] **Fig. 4** shows a cross-sectional view of the end protector;

[0023] **Fig. 5** shows the end protector being fastened to a tubular element.

[0024] **Fig. 6** shows a perspective view of an end protector, according to another embodiment of the present invention.

Description of Embodiments

- 15 [0025] The present invention will now be described more fully hereinafter with reference to the accompanying drawings in which a preferred embodiment of the invention is shown. This invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. Rather, the embodiments are provided so that this disclosure will be
20 thorough, and will fully convey the scope of the invention to those skilled in the art.

[0026] As used herein, the term "end protector" broadly refers to a device designed to cover and protect the open-end section of a pipe or any similar tubular element. In the following, similar terms such as "plug" or "lid" or "stopper" and the like could be used to describe generally the same device.

- 25 [0027] Now referring to the drawings, **Fig. 1**, **Fig. 2** and **Fig. 3** illustrate an end protector **1** of the present invention, which is designed for mounting on a pipe or tubular element. According to an embodiment of the present invention, the end protector **1** is a short cylindrical shape with a circular side portion **2** that extends

around a closed bottom end **3**. The bottom **3** of the end protector **1** is made of a material that is easily foldable when the side portion **2** is pressed. The end protector **1** extends in a longitudinal direction from the bottom end **3** to an open top end **4**, defining the height of the side portion **2**. In the embodiment shown in **Fig. 1**, the top end **4** is formed with a brim **5** along the side portion **2**, i.e., around the perimeter of the end protector **1**. In an exemplary embodiment, the end protector **1** is cylindrical in shape, but it could also have other shape without limiting the scope of the invention

[0028] As shown in **Fig. 1**, the side portion **2** has one or more openings in the form of a longitudinal slit **6** extending from the top to the bottom **3** of the end protector **1**, i.e., along the length of the side portion **2** in the longitudinal direction of the end protector **1**. In one embodiment of the present invention, as shown in **Fig. 1**, the end protector **1** features four longitudinal slits **6**. However, the number of slits **6** may vary without limiting the scope of the invention. In general, the end protector **1** can be implemented with one or more such slits **6**.

[0029] Furthermore, a connecting element **7**, generally U- or V-shaped but it could also have other shapes, is arranged on the interior side of the side portion **2** over each slit **6** of the end protector **1**, covering each slit **6**. The connecting element **7** is designed to cover the slit **6** while having a form or other design that extends at least partially into the interior of the end protector **1**. This configuration facilitates air penetration into the area, helping to prevent humidity and condensation problems.

[0030] The connecting element **7** is a component/part that has a generally U- or V-shaped form when viewed in cross-section, taken transverse to the longitudinal direction of the end protector **1**. The connecting element **7** forms an integrated part of the side portion **2**, extending along an interior length of the side portion **2** and aligned with the position of each slit **6**. This means that the connecting element **7** covers the slit **6** when viewed from inside of the end protector **1**. The arrangement of one or more connecting elements **7** allows the end protector **1** to be inserted into a pipe with a slightly smaller diameter than that of the end protector **1**.

[0031] Furthermore, the brim **5** has a cut-out **8** on the inner side. The cut-out **8** may be V-shaped, but it could also have other forms, such as a U-shape or a rounded shape. The position of the cut-out **8** corresponds to the position of each slit **6**. The

cut-out 8 can be either a partial or complete cut-out, designed to prevent wavering when the end protector 1 is in use.

[0032] The brim 5 has one or more elevations 11, which are generally U- or V-shaped but it could also have other shapes. The brim 5 may also deform slightly when the end protector 1 is inserted into a pipe. This deformation can be mitigated through various solutions. In the embodiment of the present invention, as shown, for example in Fig. 1, the brim 5 includes the one or more cut-outs 8 or the elevations 11. As the walls of the slits 6 come together, the sides of the cut-outs 8 or elevations 11 will move towards each other, allowing the end protector 1 to adapt to the pipe opening by using the U- or V-shaped cut-outs 8 or elevations 11, it is expected that bulging in the brim 5 will be minimal.

[0033] The end protector 1 is also shown in Fig. 3, which is a top view of the end protector 1 without elevations 11. Fig. 3 shows that the side portion 2 is formed with a number of slits 6, a corresponding number of connecting elements 7 interior to the side portion 2 (extending around each slit 6), and a corresponding number of cut-outs 8 positioned along the brim 5. The embodiment in Fig. 2 shows four such sets of slits 6, U/V-shaped connecting elements 7, and U/V-shaped cut-outs 8, positioned at equal distances. However, the invention can be implemented with a different number of such sets, which can be positioned at selected locations along the side portion 2.

[0034] As shown in Figs. 1, 2 and 3, the bottom 3 of the end protector 1 has one or more weakened sections in the form of grooves 10 and elevations 12. The grooves 10 and elevations 12 at the bottom 3 function similarly to the slits 6 and elevations 11 on the brim 5. As shown in Fig. 4, the elevations 12 at the bottom 3 have two opposite walls 13 and 14 that move towards each other, thereby reducing the size or dimension of the bottom 3. Preferably, the bottom 3 features a plurality of circular grooves 10 and a plurality of circular elevations 12. However, the bottom 3 can be implemented with specific number of the grooves 10 and the elevations 12, within the scope of the invention. In one embodiment, the grooves 10 and elevations 12 are circular in shape, as shown in Fig. 1, but they may have other designs. For example, in the case of a square-shaped end protector 1, the grooves 10 and elevations 12

may have a square design. Alternatively, the grooves **10** and elevations **12** can have various designs, all serving the function of reducing the size of the end protector **1**.

[0035] In one embodiment of the present invention, the grooves **10** and the two opposite walls **13** and **14** of the elevations **12** on the bottom **3** of the end protector **1** will move as the walls of the slits **6** move. As the walls of the slits **6** move towards each other, the two opposite walls **13** and **14** of the elevations **12** on the bottom **3** will also move towards each other, reducing the likelihood of the bottom **3** of the end protector **1** surging. The walls of the slits **6** are outward protrusions on each side that match together when the walls are pressed together, resulting in a tighter seal

10 [0036] **Fig. 4** illustrates a sectional view of the end protector **1**, including the grooves **10** and elevations **12**, where the elevations **12** at the bottom **3** have two opposite walls **13** and **14** that move towards each other, thereby reducing the size or dimension of the bottom **3**.

[0037] As shown particularly in **Fig. 5**, the end protector **1** is being fastened to a pipe **9** or a tubular element, as depicted in the cross-sectional view. The diameter of the bottom **3** of the end protector **1** is adapted to match the diameter of the pipe **9**, i.e., generally corresponding to the diameter of the pipe **9** into which the end protector **1** is to be inserted. The end protector **1** is configured to be inserted with its bottom end **3** into the pipe **9**, as indicated by an arrow **A**

20 [0038] The diameter of the end protector **1**, as indicated by an arrow **B** is generally equal to the maximum thickness, i.e., equivalent to the diameter of the pipe **9**. Since the diameter of the pipe **9** matches that of the bottom **3** of the end protector **1**, this allows the end protector **1** to enter the pipe **9**. As shown in **Fig.5**, the end protector **1** is shaped so as to be conical at the lower end of its bottom end section **3**. This means that the diameter as indicated by an arrow **C**, of the end protector **1** is equivalent to the minimal size, i.e. generally corresponding to the inner diameter of pipe **9** or smaller in diameter of the pipe **9** to be inserted into. In one embodiment, the diameter of the bottom **3** is adapted to the diameter of the pipe **9**, and the adjustment occurs as the opposite walls **13** and **14** of the elevations **12** in the bottom
30 **3** move towards each other. The user will then be able to insert and push the end protector **1** into the pipe **9**.

[0039] In use, the end protector **1** is inserted into the end of a pipe **9**. The end protector **1** is pushed in until the brim **5** contacts the end of the pipe **9**. As the end protector **1** is pressed into the pipe **9**, the walls of the slits **6** move towards each other, and the walls **13** and **14** of the elevations **12** in the bottom **3** also move
5 towards each other. The connecting elements **7**, along with the plurality of circular grooves **10** and circular elevations **12**, deform in such a way that the end protector **1** is inserted without breaking or being damaged. This ensures that the bottom **3** remains stable and does not undulate.

[0040] The bottom **3** may have optional holes (not shown) that help vent air caused
10 by temperature changes, preventing humidity and condensation. Additionally, the bottom **3** can be designed with sections/parts (not shown) that easily allow cables or smaller tubing to be pressed through the bottom **3**.

[0041] The end protector **1** is preferably made of a plastic material. This enables the end protector **1** to be injection molded. This provides cost-effective and efficient
15 manufacturing. However, the end protector **1** may also be made from other materials, such as metal

[0042] According to the embodiment shown in **Fig. 1**, the end protector **1** comprises four sets of slits **6**, four sets of U/V-shaped connecting elements **7**, four sets of U/V-shaped cutouts **8**, and four sets of elevations **11** on the side portion **2** of the end
20 protector **1**. Additionally, there are a plurality of circular grooves **10** and circular elevations **12** on the bottom **3** of the end protector **1**, which work together to ensure optimal performance as intended. As mentioned, the number of such sets may vary. It is also possible to cut the brim **5** completely through, beneath the elevation portion **11**, so that when the walls of the slits **6** press together, the elevations **11** elevate
25 higher, tighter, and more easily.

[0043] A further embodiment is described herein with reference to **Fig. 6**, where an arrow **D** indicates that slit **6** moves horizontally along the side portion **2** of the end protector **1**. As shown in **Fig. 6**, four slits **6** are used, positioned at equal distances around the perimeter of the end protector **1**.

30 [0044] A further embodiment is described herein with reference to **Fig. 6**, an arrow **D** shows that slit **6** moves vertically along the side portion **2** of the end protector **1**. In

this embodiment, four slits **6** are used, placed at equal distances around the perimeter of the end protector **1**. An arrow **E** shows that elevation **11** moves vertically along the brim **5** of the end protector **1**. In this case, four elevations **11** are used, positioned at equal distances above each slit **6** on the brim **5**. The walls of elevation **11** move together, while the slits **6**, indicated by arrow **D**, also move together.

[0045] Further, an arrow **F** shows that the grooves **10** and the elevation **12** at the bottom **3** have two opposite walls **13** and **14** that move towards each other, reducing the size or dimension of the bottom **3**. The groove **10** is designed with a raised portion, i.e., an elevation **12** that projects on the inside of the base of the end protector **1**, above the surface defined by the bottom **3**. Alternatively, the groove **10** can be designed with the elevation **12** arranged on the outside of the bottom **3** of the end protector **1**.

[0046] The invention works in such a way that when the end protector **1** is pushed into the pipe **9**, the walls of the slits **6** move towards each other, and the walls of the elevation **11** move towards each other (see **Fig. 6**). Additionally, the grooves **10** and the opposite walls **13** and **14** of the elevation **12** at the bottom **3** move towards each other. The grooves **10** and elevations **12** are positioned in such a way that the movement of the walls of the slits **6** also causes the walls **13** and **14** of the elevations **12** to move towards each other. This movement of the grooves **10** and elevations **12** ensures that the bottom **3** of the end protector **1** does not become bulging

[0047] Since the slits **6** are aligned as indicated by the arrow **C**, the movement of the walls of the slits **6** also causes the walls of the U/V-shaped cut-outs **8**, along with the grooves **10** and the elevations **12**, to move against each other. The movement of the walls in the U/V-shaped cut-outs **8** ensures that the walls of the elevation portion **11** move together simultaneously, preventing bulging of the brim **5** of the end protector **1**.

[0048] The size of each slit **6** is designed in such a way that a hole is created at the location of the elevation portion **11** and cutout **8** once the end protector **1** is mounted in pipe **9**. The user can then attach a hook to this hole and pull the end protector **1** out of the pipe. The slits **6** do not fully close together, which leaves a small hole for

venting air caused by temperature changes. This prevents the end protector **1** from being blown out and helps avoid humidity and condensation.

[0049] Consequently, and due to the fact that the end protector **1** comprises one or more longitudinal slits **6** that extends along the sides of the end protector **1**, one or
5 more U/V-shaped connecting elements **7** which covers the slits **6** on the inside, and along with the grooves **10** and the elevations **12** at the bottom **3** ensures that the end protector **1** has a reliable function when attached to the pipe **9** in question.

[0050] The slits **6**, the cutouts **8**, and the connecting elements **7** shown in **Fig. 1** are triangular in shape. Additionally, grooves **10** and elevations **12** are circular in shape.
10 However, these shapes may vary, and the invention is not limited to these specific shapes. In fact, the slits **6** and the connecting elements **7** shown in the figures can have many different shapes. The invention presents a plug with air vent. It is possible to add lids over and/or under the slits **6** to make the invention tight; all the other elements of the invention must be used to make the tight plug functional.

15 [0051] An advantage of the present invention is that the end protector can be easily mounted in pipes with varying opening sizes

[0052] Another advantage of the present invention is that the end protector securely fits in pipes or tubular elements.

[0053] One more advantage of the present invention is that the end protector can be
20 manufactured at a low cost.

[0054] The foregoing description of embodiments of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and modifications and variations are possible in light of the above teachings or may be acquired from
25 practice of the invention without departing from the scope of the invention. The embodiments were chosen and described in order to explain the principles of the invention and its practical application to enable one skilled in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated.

[0055] The invention is not limited to the embodiments described above but can be varied within the scope of the appended claims.]

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Claims

[Claim 1] 1. An end protector (1) for mounting on a tubular element (9), generally and having a side portion (2), a closed bottom end portion (3) and an open top end (4), wherein said bottom end (3) faces said tubular element (9) when mounted, and the top end (4) is enclosed by a peripheral brim (5) along said side portion (2),

characterized by,

said side portion (2) that comprises at least one longitudinal slit (6) extending from the top end (4) to the bottom end portion (3) and is formed by at least one connecting element (7) which extends at least partially into interior of said side portion (2) and connects the side portion (2) on both sides of said slit (6),

said brim (5) that comprises at least one elevation portion (11), and said closed bottom end portion (3) comprises a plurality of grooves (10) and a plurality of elevations (12).

2. The end protector (1) according to claim 1, wherein said connecting element (7) is generally U or V-shaped, is arranged on an interior side of said side portion (2) over said slit (6) of the end protector (1), covering said slit (6).

3. The end protector (1) according to claim 1, wherein said slit (6) extends from the top end (4) to the bottom end portion (3) and generally along an entire length of said side portion (2).

4. The end protector (1) according to claim 1, wherein said brim (5) comprises at least one cutout (8).

5. The end protector (1) according to claim 4, wherein said cutout (8) is generally U or V-shaped, but may also have other shapes.

6. The end protector (1) according to claim 1, wherein said elevation portion (11) is generally U or V-shaped, but may also have other shapes.

7. The end protector (1) according to claim 1, wherein said connecting element (7) is generally U or V-shaped, but may also have other shapes.

8. The end protector (1) according to any one of the preceding claims, wherein said cutout (8) and said elevation (11) are positioned generally aligned with said slit (6) and said connecting element (7).

5 9. The end protector (1) according to claim 8, wherein the cutout (8) and/or elevation (11) prevent the brim (5) from bulging.

10. The end protector (1) according to claim 1, wherein said brim (5) has a complete cut through, under the elevation portion (11).

10 11. The end protector (1) according to claim 1, wherein said bottom end portion (3) comprises at least one groove (10) and at least one elevation portion (12) extending along said bottom end portion (3).

12. The end protector (1) according to claim 1, wherein said grooves (10) and said elevations (12) are circular in shape.

15 13. The end protector (1) according to claim 1, wherein said elevations (12) at the bottom end portion (3) have two opposite walls (13 and 14) that move towards each other, thereby reducing the size or dimension of the bottom 3

20 14. The end protector (1) according to claim 1, wherein said elevations (12) at the bottom end portion (3) have two opposite walls (13 and 14) that move towards each other, thereby reducing the size or dimension of the bottom end portion (3).

25 15. The end protector (1) according to claim 14, wherein the opposite walls (13 and 14) of said elevations (12) on the bottom end portion (3) will move as the walls of the slits (6) move, as the walls of the slits (6) move towards each other, the two opposite walls (13 and 14) of the elevations (12) on said bottom end portion (3) will also move towards each other, reducing likelihood of said bottom end portion (3) of the end protector (1) surging.

30 16. The end protector (1) according to claim 1, wherein one or more slits (6) are arranged symmetrically around the side portion (2) of the end protector (1), allowing air to pass through.

17. The end protector (1) according to claim 1, wherein said bottom end portion (3) can have an optional hole that helps to vent out air caused by temperature changes, preventing humidity and condensation.

5 18. The end protector (1) according to claim 1, wherein the end protector (1) that is made of a plastic, metal or other material

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