

Coupling device and method for manufacturing a gripring to be used in such a coupling device

The invention relates to a coupling device for a tube comprising a coupling piece with an insert end for the tube and a sealing organ which is suitable for realizing a seal round the tube inserted in the coupling piece, whereby
5 the sealing organ comprises a series of elements which together form a ring enclosing the tube, and whereby the elements have been provided with at least one gripring, extending over at least a part of the circumference of the tube. Further the invention relates to a method for manufacturing a
10 gripring for such a coupling device.

Such a coupling device is known from the European patent application EP-A-0 794 378 of applicant. The known coupling device is applied with tubes of steel, stainless steel, eternite, cast iron, coated steel, PVC, polyethylene
15 and asbestos cement and will be used as connection for one or two of such tubes. On the one hand it is then important that the coupling device provides an adequate sealing and on the other hand that this sealing is capable to resist tension strains. This last function is provided by the gripring which
20 is part of the known coupling device.

It is known from the Dutch patent application 1 009 734 of applicant to embody the gripring with dents that are pressed out of the surface of the gripring. The dents border each time at one side on the slit-formed cut-aways that are
25 punched out from the gripring. A problem of the known gripring which is part of such a coupling device, is that with the application of the coupling device on tubes which have been manufactured with softer material, the gripring seems to operate as a cheese slicer, so that the tensile
30 strength of the coupling device according to the known state of the art is relatively limited. When the coupling device according to the state of art is applied with such softer materials as polyethylene, polybutene, acrylbutadienestyrene, or polypropylene, a tensile strength results which for the
35 large diameter-sizes measures approximate 6 to 7 bar, and for the smaller diameter-sizes can be measured at 15 à 16 bar.

It is known from the Dutch patent application 1 014

758 of applicant to embody the gripring with projections that substantially radially inwardly extend away from the surface of the gripring. It is proven that the coupling device provided with this gripring as applied to a tube of relatively soft material with a diameter of 200 mm, tolerates a tension strain of 25 to 30 bar.

From US-B-6,499,771 a coupling device according to the introduction is known whereby projections pressed out of the surface of the gripring are applied, which have been provided with anchor teeth extending in the plane of these projections. These known anchor teeth serve to resist axial rotation of the clamped tube.

It is an object of the invention to further improve the coupling device and to provide an alternative embodiment for this gripring, whereby the gripring can become available at lower costs.

The coupling device and the method of manufacturing a gripring that can be applied therein are to that end characterized by one or more of the appended claims.

The coupling device according to the invention has inwardly and/or outwardly pressed out projections extending away from the surface of the gripring, which are provided with anchor points or anchor teeth that extend in the plane of these projections.

The anchor teeth of the inwardly pressed projections are in particular suitable to engage on a tube of a relatively hard material such as cast iron. With the outwardly pressed out projections a suitable anchoring with the adjacently located part of the coupling device can be provided, i.e. with the pressure elements against which the gripring abuts in the assembled coupling device.

According to the invention the projections with the anchor teeth are so embodied that between the anchor points or anchor teeth relatively wide flat parts exist. Herewith a suitable anchoring is offered on tubes of softer material such as polyethylene.

The desired quality of the anchor points or anchor teeth provided on the projections is obtained by manufacturing the gripringelements, which together form the gripring

according to the invention, in a method which is characterized by the following steps:

- punching of adjacently located cut-aways in a metal plate such that between the cut-aways relatively thin material-connections remain;
- pressing out the metal of the surface of the plate on at least one first side of the adjacently located cut-aways until the material-connections have been torn loose;
- forcing the pressed out metal back until it is substantially located on the opposite side of the plate and it extends from the plate's plane in the form of a finished first projection.

By deforming the metal as a result of pressing out of the plane of the plate, the material which is located adjacent to the cut-aways is strengthened, while by tearing loose the material connections, anchor points or anchor teeth are obtained which are not only solid but are also provided with a very sharp point with an underneath sided burr which is the result of punching of the cut-aways. The burr is very useful for anchoring in the tube for the benefit of which the gripring is applied in a coupling device.

The invention will be further elucidated with reference to the drawing, which

in Fig. 1 shows in exploded view the coupling device according to the invention;

in Fig. 2 shows a part of the coupling device according to the invention;

in Fig. 3 shows a detail of Fig. 2;

in Fig. 4A-4D shows a number of sequential steps in the manufacturing of a gripringelement according to a first embodiment according to the invention and;

in Fig. 5A-5D shows a number of sequential steps in the manufacturing of a gripringelement according to a second embodiment according to the invention.

In the figures same identical reference numerals refer to similar parts.

Referring now first to Fig. 1 a coupling device in exploded view is shown which comprises a coupling piece 1 with an insert end 2 for a not shown tube, and a sealing

organ 3, 4, 5, which is suitable for realizing a seal round the tube inserted in the coupling piece 1. The sealing organ 3, 4, 5, comprises a generally rubber sealing ring 5, and a series of elements which together form a ring 4, whereby the elements 4 embody a gripring 3 extending over at least a part of the circumference of the tube, and whereby the gripring 3 is embodied with projections extending away from the plane of the gripring.

Fig. 2 shows a detail of the coupling device shown in Fig. 1 in exploded view, whereby it is clearly visible that the gripring 3 is assembled from separate and adjacently positioned gripelements 3', 3''. In Fig. 3 this is shown in even larger detail.

The gripelements 3', 3'' together form a closed ring and have been applied on the inside of one or more pressure elements 4'. Such a pressure element 4' is for example one pressure element of a series of equivalent pressure elements which are mutually adjustable and together form the ring 4. This ring 4 cooperates with the rubber sealing ring 5 for providing a clamping seal on a tube on which the coupling device is applied. For a complete description of the possible embodiment of the coupling device, reference is for instance made to EP-A-0 794 378 and the European application 06812739.8, which applications are deemed to be inserted and comprised herein.

Further referring now to Figs. 4A-4D and Figs. 5A-5D each time four process steps are shown, according to which a single gripelement 3', 3'' according to a first respectively second embodiment is manufactured. To this end the right side of Figs. 4A-4D and Figs. 5A-5D each time shows a cross section and a top view, while at the left side each time a perspective view from the bottom side respectively the upper side of the plate 6 is shown which is formed to a finished gripelement 3', 3''.

Referring to Figs. 4A-4D first the manufacturing of a gripelement 3', 3'' according to a first embodiment will be discussed.

In Fig. 4A it is first shown that the plate 6 is processed by providing this plate with adjacently located

cut-aways 7 by means of punching, such that between the cut-aways 7 relatively thin material-connections remain.

Further Fig. 4B shows that at a first side 9 of the adjacently located cut-aways 7 the metal of the plate 6 is pressed out of the plane thereof until a bulge 10 is formed and the material-connections 8 have been torn loose.

Further in Fig. 4C it is shown that the pressed out metal 10 is forced back until it is substantially located on the opposite side of the plate 6. This is clearly shown in the cross section on the right side of Fig. 4C, as well as in the perspective view as shown on the left side of Fig. 4C. Here it is shown that the pressed out metal 10 is forced back until it is located in the form of the finished first projection 11.

In Fig. 4D finally it is shown that the extremities 12 and 13 of the plate 6 have been forced, whereby the gripelement 3', 3'' has been shaped in a form ready for application. The forced ends 12, 13 of the plate 6 have been shown in Fig. 3 and serve to embrace the edges of the pressure part 4' and to be connected therewith.

In Figs. 5A-5D the method for manufacturing of a gripelement 3', 3'' is shown according to a second embodiment, which distinguishes from the explained method in Figs. 4A-4D in the following aspect.

Fig. 5C shows according to Fig. 4C that the pressed out material 10 is forced back until it is substantially located on the opposite side of the plate 6 (indicated with arrow H) and extends from its plane in the form of a finished first projection 11.

Simultaneously with the forming of the first projection 11, it is realised with the variant shown in Fig. 5A-5D, that at a second side 14 opposite to the first side 9 of the adjacent cut-aways 7, a forcing of the metal of the plate 6 occurs until a ready second projection 15 is provided that extends away from the plate 6 in a direction opposite to the direction of the ready first projection 11.

In Fig. 3 it is clearly shown that these second projections 15 can very advantageously mesh in the material of the pressure element 4' so that a very position-accurate

coupling between the gripelements 3', 3'' and the pressure elements 4' of the pressure ring 4 is obtained.

The method for manufacturing the gripelements 3, 3'' explained with reference to Figs. 4A-4D and Figs. 5A-5D results therein that both the first projections 11 and the second projections 15 are provided with stable anchorpoints or anchorteeth 16 respectively 17, extending in the plane of the concerning projections 11, 15, which have particularly high material stiffness due to the method of manufacturing the gripelements 3', 3''.

The mentioned figures further show that between the anchorpoints or anchorteeth 16 of the inwardly pressed out projections 11 comparatively wide flat parts 18 are located. Such comparatively wide flat parts are also located between the anchor points or anchor teeth 17 of the outwardly pressed out projections 15, and are indicated with reference numeral 19.

CLAIMS

1. Coupling device for a tube comprising a coupling piece (1) with an insert end (2) for the tube and a sealing organ (3, 4, 5) which is suitable for realizing a seal round the in the coupling piece (1) inserted tube, whereby the
5 sealing organ (3, 4, 5) comprises a series of elements which together form a ring (4) enclosing the tube, and whereby the elements have been provided with at least one gripring (3), extending over at least a part of the circumference of the tube, which at least one gripring (3) is embodied with in-
10 wardly and/or outwardly pressed out first projections (11) respectively second projections (15) extending away from the surface of the gripring (3), whereby the first projections (11) respectively the second projections (11, 15) are provided with, in the plane of these projections (11, 15) ex-
15 tending first anchor teeth (16) respectively second anchor teeth (17), **characterized** in that between the first anchor teeth (16) and/or between the second anchor teeth (17), relative to the dimensions of these teeth, comparatively wide flat parts (18, 19) exist.

20 2. Method for manufacturing a gripelement (3', 3'') suited for application in the coupling device according to claim 1, **characterized** in that the method comprises the following steps:

- punching of adjacently located cut-aways (7) in a
25 metal plate (6) such that between the cut-aways relatively thin material-connections (8) remain;

- pressing out the metal of the surface of the plate on at least one first side (9) of the adjacently located cut-aways (7) until the material-connections (8) have been torn
30 loose;

- forcing the pressed out metal (10) back until it is substantially located on the opposite side of the plate (6) and it extends from its plane in the form of a finished first projection (11).

35 3. Method according to claim 2, **characterized** in that furthermore it comprises the step of forcing the metal of the plate (6) at a second side (14), located opposite to

the first side (9) of the adjacently located cut-aways (7), into a second projection (15) which extends from the plate (6) in an direction opposite to that of the finished first projection (11).