In fact, the only known technique, to some extent, is to use very high strength materials (for example exotic steel alloys at relatively high cost) at the expense of limitations in terms of toughness, corrosion resistance, other manufacturing issues and, of course, limited wall thickness. Currently the forging/casting thickness limitation is a showstopper for large diameter vessels and high-pressure applications.

It is an object of the present invention to overcome these disadvantages from the prior art.

Summary of the invention

The object is achieved by providing a fluid swivel according to claim 1, for allowing transfer of a fluid across a rotary interface in a swivel rotational central plane between an incoming fluid line and an outgoing product piping; the swivel comprising an inner annular element and an outer annular element, that are located with their adjacent cylindrical surfaces in a close proximity, the inner annular element and the outer annular element defining in the swivel rotational central plane a chamber between the adjacent cylindrical surfaces of the inner and outer annular elements for receiving the fluid, wherein the inner annular element of the swivel is arranged with a connecting conduit to be connected to an end of the incoming fluid line which extends through said element to the chamber for supply of the fluid to the chamber, and wherein the outer annular element of the swivel is arranged to be connected to the outgoing product piping and is provided with a primary duct for transport of the fluid from the chamber to the product piping, wherein the swivel comprises a primary outer reinforcing annular wall arranged adjacent to and around the outer peripheral wall of the outer annular element, the primary outer reinforcing annular wall being arranged with two peripheral centering surface portions for contacting and/or registering with the outer peripheral wall of the outer annular element, the primary outer reinforcing annular wall further being arranged with at least a first central peripheral opening extending along a portion of the periphery of the outer reinforcing annular wall for allowing the primary duct to pass through there.

Thus, the swivel is designed to maintain the forging thickness/casting well below 350 mm and to use several layers to achieve the required wall thickness. However, mechanical links must be ensured between the outer annular element and the outer reinforcing wall. In fact, the radial expansion of the outer annular element must be

The present invention ~~als0~~ also relates to a method for manufacturing a toroidal fluid swivel as defined in claim 16, for manufacturing a toroidal fluid swivel for transfer of a fluid across a rotary interface in a swivel rotational central plane between an incoming fluid line and an outgoing product piping; the swivel comprising an inner annular element and an outer annular element, that are located with their adjacent cylindrical surfaces in a close proximity, the inner annular element and the outer annular element defining in the swivel rotational central plane a chamber between the adjacent cylindrical surfaces of the inner and outer annular elements for receiving the fluid, wherein the inner annular element of the swivel is arranged with a connecting conduit to be connected to an end of the incoming fluid line which extends through said element to the chamber for supply of the fluid to the chamber, and wherein the outer annular element of the swivel is arranged to be connected to the outgoing product piping and is provided with a primary duct for transport of the fluid from the chamber to the product piping, the method comprises arranging a primary outer reinforcing annular wall adjacent to and around the outer peripheral wall of the outer annular element; arranging the primary outer reinforcing annular wall with two peripheral centering surface portions for contacting and/or registering with the outer peripheral wall of the outer annular element, and arranging the primary outer reinforcing annular wall further with at least a first central peripheral opening extending along a portion of the periphery of the outer reinforcing annular wall for allowing the primary duct to pass through there.

Advantageous embodiments are further defined by the dependent claims.

Brief description of drawings

The invention will be explained in more detail below with reference to drawings in which illustrative embodiments of the invention are shown. It will be appreciated by the person skilled in the art that other alternative and equivalent embodiments of the invention can be conceived and reduced to practice without departing from the true spirit of the invention, the scope of the invention being limited only by the claims.

Figure 1 shows a first perspective view of a sector of a swivel outer part according to an embodiment of the invention;

Figure 2 shows a second perspective view of a sector of a swivel outer part of Fig. 1;

Figure 3 and 4 show a detailed view of a sector of a swivel outer part of Fig. 1;

Figure 5 shows a cross-section of a swivel wall according to the prior art;

Figure 6 shows a cross-section of a swivel wall according to an embodiment of the invention;

Figure 7 shows a cross-section of a swivel wall according to the prior art;

Figure 8 shows a cross-section of a swivel wall according to an embodiment of the invention, and

Figure 9 shows a cross-section of a swivel wall according to an embodiment of the invention.

In the drawings, the same reference numerals refer to similar or identical components in each of the figures.

Detailed description of embodiments

Figure 5 shows a cross-section of a swivel wall of a toroidal fluid swivel according to the prior art.

A toroidal fluid swivel is arranged for transfer of a fluid F across a rotary interface R within a swivel rotational central plane SP between an incoming fluid line and an outgoing product piping. The rotation axis A is perpendicular to the swivel rotational central plane SP. The toroidal fluid swivel comprises an inner annular

Claims

1. A fluid swivel for allowing transfer of a fluid across a rotary interface in a swivel rotational central plane between an incoming fluid line and an outgoing product piping; the swivel comprising an inner annular element and an outer annular element, that are located with their adjacent cylindrical surfaces in a close proximity, the inner annular element and the outer annular element defining in the swivel rotational central plane a chamber between the adjacent cylindrical surfaces of the inner and outer annular elements for receiving the fluid, wherein the inner annular element of the swivel is arranged with a connecting conduit to be connected to an end of the incoming fluid line which extends through said element to the chamber for supply of the fluid to the chamber, and wherein the outer annular element of the swivel is arranged to be connected to the outgoing product piping and is provided with a primary duct for transport of the fluid from the chamber to the product piping,
wherein the swivel comprises a primary outer reinforcing annular wall arranged adjacent to and around the outer peripheral wall of the outer annular element, the primary outer reinforcing annular wall being arranged with two peripheral centering surface portions for contacting and/or registering with the outer peripheral wall of the outer annular element,
the primary outer reinforcing annular wall further being arranged with at least a first central peripheral opening extending along a portion of the periphery of the outer reinforcing annular wall for allowing the primary duct to pass through there.

2. Swivel according to claim 1, wherein the peripheral centering surface portions are arranged as a recessed rim with an upper and lower inward edge, arranged to receive the outer peripheral wall of the outer annular element in between the inward edges with an upper edge of the outer peripheral wall fitting the upper inward edge and a lower edge of the outer peripheral wall fitting the lower inward edge.

3. Swivel according to claim 1 or 2, wherein the primary outer reinforcing annular wall further being arranged with one or more additional central peripheral

11. Swivel according to any one of claims 8 – 10, wherein the spacer rings may be manufactured from a material selected from the group comprising steel, steel alloys and composites.

12. Swivel according to claim 10 or 11, wherein the steel comprises forged steel, rolled steel plate and cast steel.

13. Swivel according to any one of the preceding claims, wherein the primary duct either is a nozzle or comprises a nozzle shaped portion.

14. Swivel according to according to any one of the preceding claims, wherein additionally a between the outer annular element of the swivel and the associated outer reinforcing ring a secondary annular chamber is created inbetween the centering surface positions, the secondary annular chamber being arranged for coupling to a hydraulic system arranged for injecting hydraulic fluid into said secondary annular chamber.

15. Swivel according to according to any one of the preceding claims, wherein additionally a between the inner annular element of the swivel and the associated inner reinforcing ring a further annular chamber is created inbetween the centering surface positions, the further annular chamber being arranged for coupling to a hydraulic system arranged for injecting hydraulic fluid into said further annular chamber.

16. Method for manufacturing a toroidal fluid swivel for transfer of a fluid across a rotary interface in a swivel rotational central plane between an incoming fluid line and an outgoing product piping; the swivel comprising an inner annular element and an outer annular element, that are located with their adjacent cylindrical surfaces in a close proximity, the inner annular element and the outer annular element defining in the swivel rotational central plane a chamber between the adjacent cylindrical surfaces of the inner and outer annular elements for receiving the fluid, wherein the inner annular element of the swivel is arranged with a connecting conduit to be connected to an end of the incoming fluid line

which extends through said element to the chamber for supply of the fluid to the chamber, and wherein the outer annular element of the swivel is arranged to be connected to the outgoing product piping and is provided with a primary duct for transport of the fluid from the chamber to the product piping,

the method comprising:

arranging a primary outer reinforcing annular wall adjacent to and around the outer peripheral wall of the outer annular element;

arranging the primary outer reinforcing annular wall with two peripheral centering surface portions for contacting and/or registering with the outer peripheral wall of the outer annular element,

arranging the primary outer reinforcing annular wall further with at least a first central peripheral opening extending along a portion of the periphery of the outer reinforcing annular wall for allowing the primary duct to pass through there.