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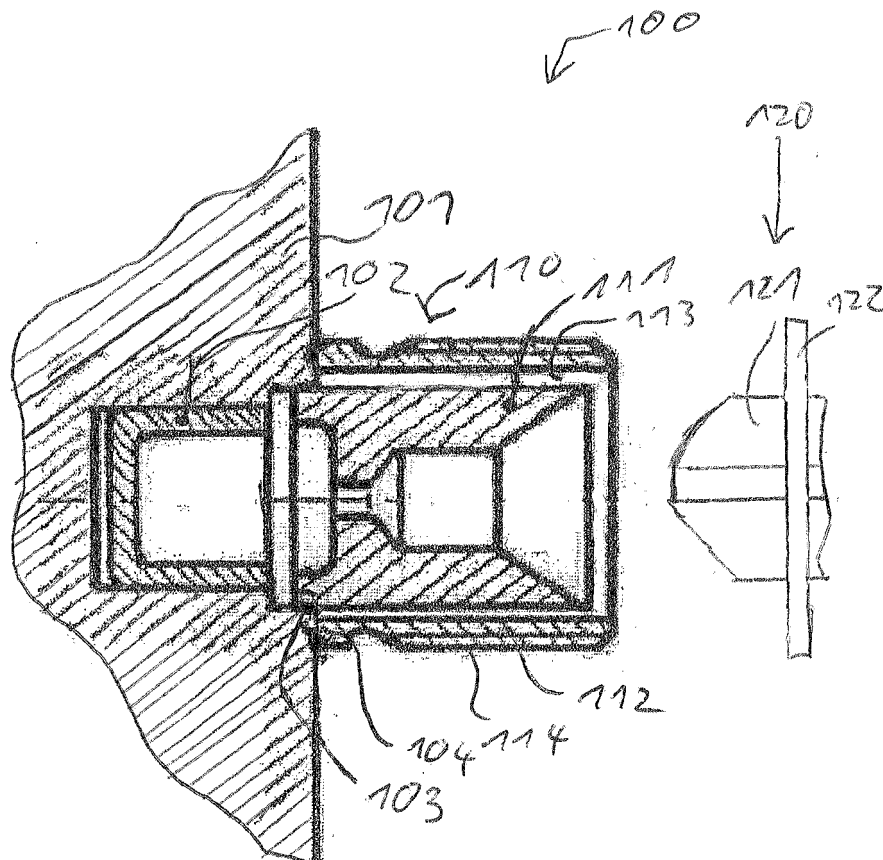
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(54) **Fluid fitting arrangement and fluid system**

(57) A fluid fitting arrangement (100) comprises a first part (101) of a fluid system and a coupling arrangement (110). The coupling arrangement comprises a tube element (111) for hydraulically coupling the first part (101) of the fluid system with a second part (120) of the fluid system, the tube element (111) being hydraulically coupled with the first part (101) of the fluid system and being

hydraulically coupleable with the second part (120) of the fluid system. The coupling arrangement further comprises a threaded sleeve (112) for mechanically coupling the first part (101) of the fluid system with the second part (120) of the fluid system, the threaded sleeve (112) being mechanically coupled with the first part (101) of the fluid system and being mechanically coupleable with the second part (120) of the fluid system.



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## Description

**[0001]** The invention relates to a fluid fitting arrangement. Furthermore, the invention relates to a fluid system comprising such fluid fitting arrangement.

**[0002]** With respect to fuel systems in vehicles, fittings are known that are welded, for example, on high-pressure fuel pumps. These fittings conventionally provide a hydraulic as well as a mechanical connection in one single element. Particularly with regard to the outlet connections of the high-pressure fuel pumps, these conventional fittings are subjected to fatigue stresses due to pressure pulsations of the fluid.

**[0003]** It is desirable to create a fluid fitting arrangement which is reliable. Furthermore, it is desirable to create a fluid system which works reliably.

**[0004]** According to one embodiment of the invention, the fluid fitting arrangement comprises a first part of a fluid system. The fluid fitting arrangement further comprises a coupling arrangement.

**[0005]** The coupling arrangement comprises a tube element for hydraulically coupling the first part of the fluid system with a second part of the fluid system. The tube element is hydraulically coupled with the first part of the fluid system. Furthermore, the tube element is hydraulically coupleable with the second part of the fluid system.

**[0006]** The coupling arrangement further comprises a threaded sleeve for mechanically coupling the first part of the fluid system with the second part of the fluid system. The threaded sleeve is mechanically coupled with the first part of the fluid system. The threaded sleeve is further mechanically coupleable with the second part of the fluid system.

**[0007]** The coupling arrangement comprises two elements for providing the hydraulic and the mechanical coupling to the first part of the fluid system. Therefore, the threaded sleeve that provides the mechanical coupling is not subject to direct pressure pulsations since the fluid under pressure is guided only in the tube element during operation. Therefore, the coupling between the threaded sleeve and the first part of the fluid system, for example a high-pressure pump, is reliable and durable. Particularly, a tension force in direction away from the first part is only affected to the threaded sleeve. The tension force is not affected to the tube element. The tension force is for example affected due to the pressure pulsation of the fluid during operation.

**[0008]** According to a further aspect, the tube element and the threaded sleeve are provided as separate parts. The threaded sleeve surrounds the tube element coaxially and the threaded sleeve is radially disposed at a distance from the tube element according to further embodiments.

**[0009]** Due to the separation of the tube element and the threaded sleeve the coupling of the coupling arrangement with the first part of the fluid system is particularly reliable, since the tube element primarily serves for the hydraulic coupling and the threaded sleeve primarily

serves for the mechanical coupling. On the other hand, that means that the tube element primarily serves not for a mechanical coupling of the first part with the second part and the threaded sleeve primarily serves not for a hydraulic coupling of the first part with the second part.

**[0010]** According to further embodiments, the first part of the fluid fitting arrangement is a pump for the delivery of the fluid, for example a high-pressure pump for the delivery of fuel in a vehicle. The coupling arrangement provides a reliable fluid supply to the high-pressure pump. In particular, the coupling arrangement provides a reliable fluid supply on the outlet of the pump.

**[0011]** According to an embodiment, the fluid system comprises such a fluid fitting arrangement. The fluid system further comprises the second part that is coupled to the coupling arrangement.

**[0012]** That way, a coupling between the first and the second part of the fluid system is provided in which the hydraulic coupling and the mechanical coupling are separate from each other. Therefore, the coupling is reliable. Particularly, a tension force by the second part in direction away from the first part is only affected to the threaded sleeve. The tension force is not affected to the tube element. The tension force is for example affected due to the pressure pulsation of the fluid during operation.

**[0013]** Reference will now be made in detail to the preferred embodiments, examples of which are illustrated in the accompanying drawing.

**[0014]** The figure schematically shows a fluid fitting arrangement according to an embodiment.

**[0015]** The figure schematically shows a fluid fitting arrangement 100. The fluid fitting arrangement 100 comprises a first part 101 of a fluid system. In the exemplary embodiment, the first part 101 is part of a high-pressure pump for the delivery of the fluid. For example, the first part 101 is a housing of the pump.

**[0016]** The fluid fitting arrangement 100 further comprises a coupling arrangement 110. The coupling arrangement 110 is coupled with the first part 101, for example with the housing of the pump 101.

**[0017]** The coupling arrangement comprises a tube element 111 and a threaded sleeve 112. The threaded sleeve 112 comprises a hollow cylindrical form such that the threaded sleeve 112 surrounds the tube element 111 radially. The threaded sleeve 112 surrounds the tube element 111 such that a distance 113 is disposed between the tube element 111 and the threaded sleeve 112 along the longitudinal extension of the threaded sleeve 112 and the tube element 111. Furthermore, the threaded sleeve 112 comprises a thread 114 which provides a mechanical coupling interface for a second part 120 of the fluid system.

**[0018]** The tube element 111 and the threaded sleeve 112 of the coupling arrangement 110 are provided as separate parts. The tube element 101 is hydraulically coupled with the pump 101. Further, the tube element 111 is coupled with the pump 101 via a welded connection 103. A first end of the tube element 111 is coupled

with the pump 101 and the opposite end region of the tube element is hydraulically coupleable. The tube element 111 provides a hydraulic interface to the pump 101 for a hydraulically coupling with the second part of the fluid system.

**[0019]** The threaded sleeve 112 of the coupling arrangement 110 is mechanically coupled to the pump 101 via a second welded connection 104. A first end of the threaded sleeve 112 is coupled with the pump 101 and the opposite end region of the threaded sleeve is mechanically coupleable. The threaded sleeve 112 provides a mechanical interface to the pump 101 for a coupling with the second part of the fluid system.

**[0020]** Each of the threaded sleeve 112 and the tube element 111 is coupled to the pump 101 by the respective welded connection 103, 104. The welded connections 103 and 104 are separate as well.

**[0021]** When the coupling arrangement 110 is coupled with the second part 120 of the fluid system during operation, the threaded sleeve 110 provides the mechanical coupling between the pump 101 and the second part 120. The hydraulic coupling to the second part 120 is provided by the tube element 111. During operation, the fluid is guided from the pump 101 via the tube element 111 to a tube 121 of the second part 120. During operation, the threaded sleeve 111 is free of fluid and does not guide any fluid but secures the second part 120 to the pump 101, for example via a coupling nut 122 that is connected with the thread 114 of the threaded sleeve 112. The nut 122 mechanically couples the second part 120 to the pump 101 via the threaded sleeve 111. The threaded sleeve 121 is mechanically coupled to the pipe 121 that is hydraulically coupled to the tube element 111.

**[0022]** Since the mechanical and the hydraulic couplings are divided into two separate couplings, the mechanical coupling is particularly independent from the hydraulic coupling. The welded connection 103 that couples the tube element 111 with the pump 101 primarily needs to resist the pressure of the fluid during operation. The welding 104 primarily needs to resist the mechanical connection of the second part 120. The welding 104 does primarily not need to resist the hydraulic pressure of the fluid guided through the coupling arrangement. Therefore, each of the welded connections 103 and 104 is particularly reliable. Furthermore, the tube element 101 provides a hermetically sealed fluid connection from the pump 101 via the outlet valve 102 to the tube 121. Since the hermetic fluid connection is provided by the tube element 111, the welded connection 104 of the threaded sleeve 112 must not be a hermetic welding.

**[0023]** In a preferred embodiment, the coupling arrangement is part of an outlet valve 102 of the pump 101. The outlet valve 102 is arranged in a cavity of the housing of the pump 101 and provides an outlet of the delivered fluid under high pressure.

**[0024]** According to further embodiments, the coupling between the tube element 111 and the housing of the pump 101 is provided by a threaded connection between

the tube element and the pump. According to further embodiments, the coupling is provided by press fitting or by clamping. According to yet another embodiment, the tube element is an integrated part of the housing of the pump 101.

**[0025]** According to further embodiments, the coupling between the threaded sleeve 112 and the housing of the pump 101 is provided by a threaded connection between the threaded sleeve and the pump. According to further embodiments, the coupling is provided by press fitting or by clamping. According to yet another embodiment, the threaded sleeve 112 is an integrated part of the housing of the pump 101.

## Claims

### 1. Fluid fitting arrangement (100), comprising

- a first part (101) of a fluid system and
- a coupling arrangement (110), the coupling arrangement comprising:
  - a tube element (111) for hydraulically coupling the first part (101) of the fluid system with a second part (120) of the fluid system, the tube element being hydraulically coupled with the first part (101) of the fluid system and being hydraulically coupleable with the second part (120) of the fluid system, and
  - a threaded sleeve (112) for mechanically coupling the first part (101) of the fluid system with the second part (120) of the fluid system, the threaded sleeve being mechanically coupled with the first part of the fluid system and being mechanically coupleable with the second part (120) of the fluid system.

2. Fluid fitting arrangement according to claim 1, wherein the tube element (111) and the threaded sleeve (112) are provided as separate parts.

3. Fluid fitting arrangement according to claim 1 or 2, wherein the threaded sleeve (112) surrounds the tube element (111) coaxially.

4. Fluid fitting arrangement according to one of claims 1 to 3, wherein the threaded sleeve (112) is radially disposed at a distance (113) from the tube element (111).

5. Fluid fitting arrangement according to one of claims 1 to 4, wherein the threaded sleeve (111) comprises an elongated hollow cylindrical form.

6. Fluid fitting arrangement according to one of claims 1 to 5, wherein the threaded sleeve (112) comprises a thread (114) for mechanically coupling the threaded sleeve (112) with the second part (120) of the

fluid system.

7. Fluid fitting arrangement according to one of claims 1 to 6, wherein the threaded sleeve (112) is free of fluid. 5
8. Fluid fitting arrangement according to one of claims 1 to 7, comprising a welded connection (103) to couple the tube element (111) with the first part (101). 10
9. Fluid fitting arrangement according to one of claims 1 to 8, comprising a welded connection (104) to couple the threaded sleeve (112) with the first part (101).
10. Fluid fitting arrangement according to one of claims 1 to 9, wherein the first part (101) is a pump for the delivery of the fluid. 15
11. Fluid fitting arrangement according to claim 10, wherein the coupling arrangement (110) is part of an outlet valve (102) of the pump (101). 20
12. Fluid system, comprising:
  - a fluid fitting arrangement according to one of claims 1 to 11, and 25
  - the second part (120), the second part (120) being coupled to the coupling arrangement (110). 30

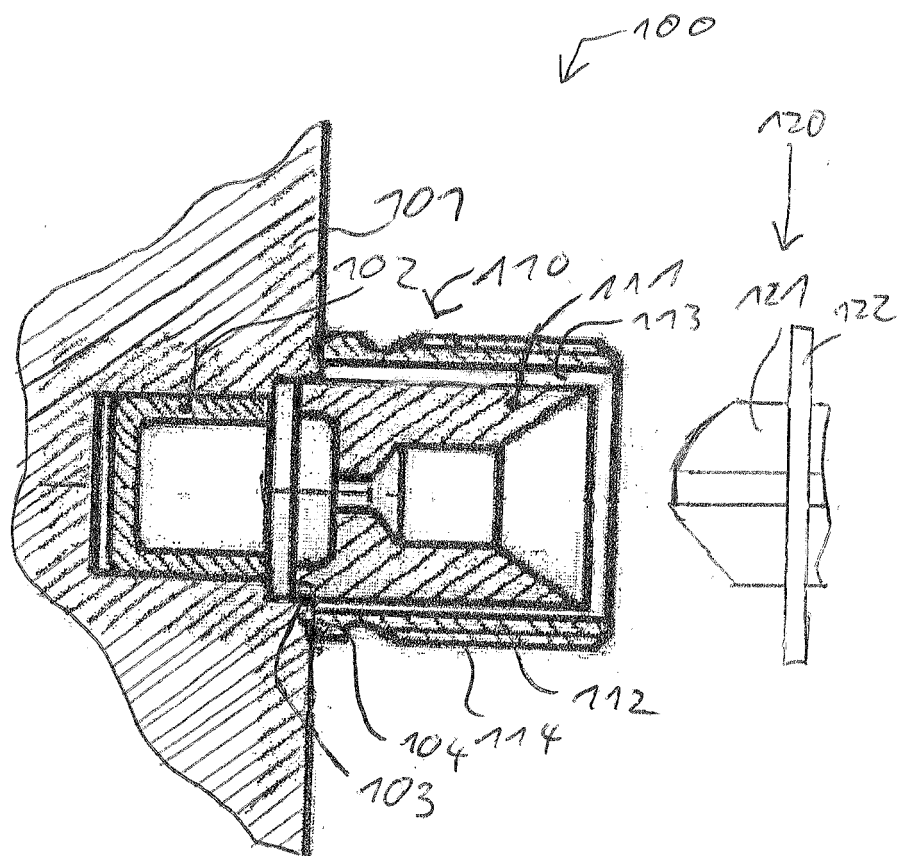
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Application Number  
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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                              |                                                 |                                         |
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| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                              |                                                 |                                         |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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The members are as contained in the European Patent Office EDP file on  
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