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Compliant Mount

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A wet-mate connection system is a connection between a first and a second connector in a wet environment.

The wet-mate connection comprises a first and a second wet-mate connector attached to a first and a second structure respectively. The first and the second wet-mate connector may also be referred to as two wet-mate connector halves. To establish the wet-mate connection, the first and the second structure are moved towards one another, e.g. are pulled/pushed together, so that the first and second part of the wet-mate connector come face-to-face. Upon connecting the second connector half to the first connector half, it is desired to compensate for any misalignment of the relative position of the first and the second connector halves upon mating, e.g. to reduce the loads of the connected parts and/or to improve the connection to reduce the chance of connection failure or leakage. Further, the attachment of the first connector half to the first structure or to a mounting plate of the first structure (or to a mounting plate being the first structure) may secure the connector at a pre-defined position and provide mating stability.

This publication relates to a compliant mount, an apparatus for attaching a first wet-mate connector half onto a structure or a mounting plate, wherein the apparatus is designed for three main functions:

1) Mounting of the first wet-mate connector half at a pre-defined position.
2) Providing mating stability to facilitate connection of the first wet-mate connector half to the second wet-mate connector half.
3) Compensating for any misalignment of the wet-mate connectors upon mating.

The compliant mount is designed to create a connection between the structure, which the compliant mount is mounted at, and the second, other structure. The connection is made between the second connector half being arranged at the second structure and the first connector half attached to the compliant mount, which is mounted at the mounting structure. As will be presented below, the features of the compliant mount are designed to fulfil the functions listed above.

The first connector half comprises a mount flange which is the interface to the compliant mount. Additionally, the first connector half comprises an alignment feature, which will be brought into contact with a corresponding alignment feature of second connector half during mating.

The compliant mount is connected to a mounting plate of the mounting structure, which comprises a flange pocket for receiving the mounting flange. In this example the flange pocket is a circular bore. The first connector half and the mounting flange are inserted into the flange pocket of the mounting structure and secured by a retainer plate. The connection between the first and second connector halves is achieved by arranging the mounting structure and the second structure next to one another, and then applying force to push/pull the first connector part of the mounting structure and the second connector part of the second structure together.

The compliant mount further comprises a spring-loaded pin assembly. The spring-loaded pin assembly comprises a retainer plate and spring housings, and the following functions:

- Creating the required preload upon connection of the two connector halves

- Allow displacement and tilting of the mount flange inside the flange pocket, thus providing radial and angular misalignment allowance
- Exerting spring force on the self-centring groove to install the mount flange at nominal position.

In this example, the retainer plate, which secures the first connector half and the mounting flange in the flange pocket, constitutes also the spring-loaded pin assembly. Each spring housing houses a spring and a presser pin. In this example, each spring housing comprises a central bore to align the presser pin at the centre of the spring housing and enable the presser pin to move completely inside the spring housing upon compression of the spring. Upon exerting a force on the presser pin, the spring will be compressed and exert the spring force onto the housing, which thereafter is transferred onto the retainer plate. As the retainer plate is secured to the mounting plate and the mounting structure, the springs create a force acting against the force compressing the spring. Said force is e.g. required for pre-load and/or the individual movement of the presser pins and its corresponding spring may enable allowance of misalignment as described below.

The spring loaded pin assembly comprises multiple spring housings distributed around the first connector half to enable positioning of the compliant mount. The spring elements are arranged at the retainer plate to exert a force on the mounting flange in the flange pocket, wherein the mounting flange comprises a self-centring groove. The self-centring groove is a groove, which is arranged at the mounting flange and is facing the presser pins. In this example, the self-centring groove is a circular groove. The force exerted upon the presser pins by the spring elements pushes the presser pins to the centre of the self-centring groove, which is the circle having the deepest recess. As the presser pins inside the spring housings are arranged concentrically at the retainer plate at a radius corresponding to the radius of the self-centring groove, the retainer plate and the first connector half are thereby aligned with the self-centring groove. This enables mounting of the first connector half at a pre-defined position.

A pre-load is required to mate the first connector part of the compliant mount and second connector part of the mounting structure. The pre-load is the contact force between the two connector halves. As the first and second structures are pushed/pulled together the connector halves will come in contact and the pre-load will increase. The first connector half will not move further along the connector's axis, as the second connector half is hindering its movement. With the push/pull force still applied, a locking mechanism may be engaged between the mounting structure and the second structure so that the required pre-load is maintained.

During connection of the compliant mount, the first connector half may be displaced relative to the second connector half. The compliant mount features an allowance of misalignment of a radial displacement d and an angular misalignment α. Displacement d is achieved by having the flange pocket of the mounting structure with a bigger diameter than the mounting flange diameter itself, i.e., d is equal to the difference in the mount flange and pocket radii.. Additionally, the flange pocket is deeper than the flange thickness, allowing the flange to tilt whilst being still within the flange pocket, thus producing angular misalignment allowance.

The compliant mount may be designed for the second wet-mate connector half using the same concept as described above, in combination with the same preload-maintaining locking principle. In some examples, either the first or the second or both of the first and second wet-mate connector halves may comprise a compliant mount.

Multiple compliant mounts may be utilized at the same structures or mounting plates for multiple different connectors, e.g. for a three-phase or multiphase systems.