SIGNAL CONNECTOR SYSTEM

RELATED APPLICATIONS

[0001] This application claims priority from U.S. Patent Application Serial No. 16/806575, filed 2 March 2020, which is incorporated herein in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates generally to communications, and specifically to a signal connector system.

BACKGROUND

[0003] Signal connectors that provide electrical connection between a pair of wires are necessary in nearly every piece of wired communications environment. There are numerous environmental challenges that can arise from ensuring connection of wires over long distances, such as to facilitate the use of signal connectors. One such environmental challenge includes the use of signal connectors in environments that can provide electrical conduction in ambient conditions. For example, electrical connections may be required in environments such as in fluids, such as water (e.g., seawater), that may create challenges in ensuring that separate signal conductors do not experience conduction between each other. Such conduction can lead to noise and/or cross-talk in the respective signals that are transmitted. Some connectors that can be implemented in such environments may be formed of non-traditional conductive materials. However, such materials, while potentially solving some of the environmental challenges, can introduce new challenges in such environments.

SUMMARY

[0004] One example includes a signal connector system. The system includes a first connector comprising a first housing, and includes a first plurality of contacts formed from a self-passivating transition metal. Each of the first contacts can be configured to conduct an alternating current (AC) signal. The

system also includes a second connector comprising a second housing and a second plurality of contacts formed from the self-passivating transition metal. Each of the second contacts can be configured to electrically couple to a respective one of the first contacts to conduct the AC signal. The first and second housings can be coupled to substantially enclose the signal connector and to create at least one fluid-filled channel between each of the electrically-connected first and second contact pairs in response to fastening the first and second connectors while submerged in a respective fluid to provide a resistive path in the at least one fluid-filled channel for providing signal isolation between each of the electrically-connected first and second contact pairs.

[0005] Another example includes a method for providing a plurality of alternating current (AC) signals along a respective plurality of conductors across a signal connector system. The method includes submerging a first connector and a second connector in a fluid. The first connector includes a first housing and a first plurality of contacts formed from a self-passivating transition metal. The second connector includes a second housing and a respective second plurality of contacts formed from the self-passivating transition metal, such that a dielectric film forms on the first and second contacts in response to submersion in the fluid. The method also includes attaching the first and second connectors to provide electrical connection between the each of the first contacts and a respective one of the second contacts to conduct a respective one of the AC signals between the respective electrically-connected first and second contact pair, and to form at least one fluid-filled channel between each electrically-connected first and second contact pair. Each of the at least one fluid-filled channel forms a resistive path between electrically-connected first and second contact pairs. The method further includes fastening the first and second connectors via a first fastener associated with the first connector and a second fastener associated with the second connection portion to form the signal connector system.

[0006] Another example includes a signal connector system. The system includes a first connector. The first connector includes a first plurality of contacts formed from a self-passivating transition metal. Each of the first contacts being configured to conduct an alternating current (AC) signal. The first connector also includes a first plurality of pliable insulator supports that are coupled to a respective one of the first contacts, and a first housing configured to substantially enclose the

first pluralities of contacts and pliable insulator supports and comprising a first fastener. The system also includes a second connector. The second connector also includes a second plurality of contacts formed from the self-passivating transition metal, a second plurality of pliable insulator supports that are coupled to a respective one of the second contacts, and a second housing configured to substantially enclose the second pluralities of contacts and pliable insulator supports and comprising a second fastener. The first and second housings can be configured to be coupled via the respective first and second fasteners to create at least one fluid-filled channel between the first plurality of contacts and the second plurality of contacts while submerged in a respective fluid and to substantially enclose the signal connector and to provide electrical connection between each of the first contacts and a respective one of the second contacts at a predetermined pressure to conduct the respective AC signal between each of the first contacts and the respective one of the second contacts.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 illustrates an example diagram of a signal connector system.

[0008] FIG. 2 illustrates another example cross-sectional diagram of a signal connector system.

[0009] FIG. 3 illustrates another example cross-sectional diagram of a signal connector system.

[0010] FIG. 4 illustrates an example of a connector.

[0011] FIG. 5 illustrates an example of a signal connector system.

[0012] FIG. 6 illustrates an example of a contact.

[0013] FIG. 7 illustrates another example of a connector.

[0014] FIG. 8 illustrates another example of a connector.

[0015] FIG. 9 illustrates an example of a method for providing a plurality of AC signals along a respective plurality of conductors across a signal connector system.

DETAILED DESCRIPTION

[0016] The present disclosure relates generally to communications, and specifically to a signal connector system. The signal connector system can be implemented in any of a variety of

CLAIMS

1. A signal connector system comprising:

a first connector comprising a first housing and a first plurality of contacts formed from a self-passivating transition metal, each of the first contacts being configured to conduct an alternating current (AC) signal; and

a second connector comprising a second housing and a second plurality of contacts formed from the self-passivating transition metal, each of the second contacts being configured to electrically couple to a respective one of the first contacts to conduct the AC signal, the first and second housings being configured to be coupled to substantially enclose the signal connector and to create at least one fluid-filled channel between each of the electrically-connected first and second contact pairs in response to fastening the first and second connectors while submerged in a respective fluid to provide a resistive path in the at least one fluid-filled channel for providing signal isolation between each of the electrically-connected first and second contact pairs.

2. The system of claim 1, wherein the first connector further comprises a first plurality of pliable insulator supports that are coupled to a respective one of the first contacts, wherein the second connector further comprises a second plurality of pliable insulator supports that are each coupled to a respective one of the second plurality of contacts, each of the first and second pliable insulator supports is configured to provide contact pressure between the respective first contacts and the respective second contacts to establish electrical connection between the respective first and second contacts.

3. The system of claim 2, wherein the first pliable insulator supports and the second pliable insulator supports are coupled to the respective first contacts and the respective second contacts along a first longitudinal surface, wherein each of the first and second pliable insulator supports comprises a second longitudinal surface opposite the first surface, wherein the second longitudinal surface of each of the first pliable insulator supports and the second longitudinal surface each of the respective second pliable insulator supports defines at least a portion of a respective one of the at least one fluid-filled channel.

4. The system of claim 2, wherein each of the first and second pliable insulator supports has a predetermined elasticity sufficient to substantially mitigate galling between the first and second contacts.

5. The system of claim 1, wherein each of the first contacts comprises a tapered contact surface that is arranged to provide electrical connection with a complementary tapered contact surface of a respective one of the second contacts.

6. The system of claim 5, wherein each of one of the first and second contacts comprises a projection extending from the respective tapered contact surface to provide the electrical connection with the tapered surface of the respective other of the first and second contacts.

7. The system of claim 1, wherein the first and second contacts are arranged in a polar array about the respective first and second connectors, such that the at least one fluid-filled channel is disposed between each electrically-connected first and second contact pair about the polar array.

8. The system of claim 1, wherein the first housing comprises a male thread pattern and the second housing comprises a female thread pattern, such that each electrically-connected set of the first and second contacts can have an approximately equal contact pressure when the first and second connectors are coupled together to form the signal connector system.

9. The system of claim 1, wherein each of the at least one fluid-filled channel has a geometrical arrangement designed to provide a resistance of the respective resistive path of greater than or equal to approximately 100 Ω when filled with the associated fluid.

10. A method for providing a plurality of alternating current (AC) signals along a respective plurality of conductors across a signal connector system, the method comprising:

submerging a first connector and a second connector in a fluid, the first connector comprising a first housing and a first plurality of contacts formed from a self-passivating transition metal, the second connector comprising a second housing and a respective second

plurality of contacts formed from the self-passivating transition metal, such that a dielectric film forms on the first and second contacts in response to submersion in the fluid;

attaching the first and second connectors to provide electrical connection between the each of the first contacts and a respective one of the second contacts to conduct a respective one of the AC signals between the respective electrically-connected first and second contact pair, and to form at least one fluid-filled channel between each electrically-connected first and second contact pair, each of the at least one fluid-filled channel forming a resistive path between electrically-connected first and second contact pairs; and

fastening the first and second connectors via a first fastener associated with the first connector and a second fastener associated with the second connection portion to form the signal connector system.

11. The method of claim 10, wherein the first connector further comprises a first plurality of pliable insulator supports that are coupled to a respective one of the first contacts, wherein the second connector further comprises a second plurality of pliable insulator supports that are each coupled to a respective one of the second plurality of contacts, each of the first and second pliable insulator supports having a predetermined elasticity configured to provide a predetermined contact pressure between the respective first contacts and the respective second contacts to establish the electrical connection between the respective first and second contacts.

12. The method of claim 11, wherein the first pliable insulator supports and the second pliable insulator supports are coupled to the respective first contacts and the respective second contacts along a first longitudinal surface, wherein each of the first and second pliable insulator supports comprises a second longitudinal surface opposite the first surface, wherein the second longitudinal surface of each of the first pliable insulator supports and the second longitudinal surface each of the respective second pliable insulator supports defines at least a portion of a respective one of the at least one fluid-filled channel.

13. The method of claim 10, wherein each of the first contacts comprises a tapered contact surface that is arranged to provide electrical connection with a complementary tapered contact surface of a respective one of the second contacts.

14. The method of claim 10, wherein the first fastener is arranged as a male thread pattern and wherein the second fastener is arranged as a female thread pattern, such that fastening the first and second connectors comprises fastening the male and female thread patterns to provide an approximately equal contact pressure for each of the electrically-connected first and second contact pairs.

15. The method of claim 10, wherein each of the at least one fluid-filled channel has a geometrical arrangement designed to provide a resistance of the respective resistive path of greater than or equal to approximately 100 Ω when filled with the associated fluid.

16. A signal connector system comprising:

a first connector comprising:

a first plurality of contacts formed from a self-passivating transition metal, each of the first contacts being configured to conduct an alternating current (AC) signal;

a first plurality of pliable insulator supports that are coupled to a respective one of the first contacts; and

a first housing configured to substantially enclose the first pluralities of contacts and pliable insulator supports and comprising a first fastener; and

a second connector comprising:

a second plurality of contacts formed from the self-passivating transition metal;

a second plurality of pliable insulator supports that are coupled to a respective one of the second contacts; and

a second housing configured to substantially enclose the second pluralities of contacts and pliable insulator supports and comprising a second fastener, the first and second housings being configured to be coupled via the respective first and second fasteners to create at least one fluid-filled channel between the first plurality of contacts and the second plurality of contacts while submerged in a respective fluid and to substantially enclose the signal connector and to provide electrical connection between each of the first contacts and a respective one of the second contacts at a predetermined

pressure to conduct the respective AC signal between each of the first contacts and the respective one of the second contacts.

17. The system of claim 16, wherein the first pliable insulator supports and the second pliable insulator supports are coupled to the respective first contacts and the respective second contacts along a first longitudinal surface, wherein each of the first and second pliable insulator supports comprises a second longitudinal surface opposite the first surface, wherein the second longitudinal surface of each of the first pliable insulator supports and the second longitudinal surface each of the respective second pliable insulator supports defines a respective one of the at least one fluid-filled channel.

18. The system of claim 16, wherein each of the first contacts comprises a tapered contact surface that is arranged to provide electrical connection with a complementary tapered contact surface of a respective one of the second contacts.

19. The system of claim 16, wherein the first and second contacts are arranged in a polar array about the respective first and second connectors, such that the at least one fluid-filled channel is disposed between each electrically-connected set of the first and second contacts around the polar array, and wherein the first connection portion comprises a male thread pattern and the second connection portion comprises a female thread portion, such that each of the electrically-connected first and second contact pairs can have an approximately equal contact pressure when the first and second connectors are coupled together to form the signal connector system.

20. The system of claim 16, wherein each of the at least one fluid-filled channel has a geometrical arrangement designed to provide a resistance of the respective resistive path of greater than or equal to approximately 100 Ω when filled with the associated fluid.