

CLAIMS

What we claim is:

1. A method of manufacturing a multi-material fiber comprising at least one electrically-connectable device, the method comprising the steps of:
 - positioning a first electrical conductor longitudinally within a first conduit provided in a preform material;
 - drawing the multi-material fiber by causing the preform material to flow;
 - creating at least one pocket in the drawn multi-material fiber to expose the first electrical conductor;
 - positioning an electrically-connectable device within the pocket, such that a first electrode on the electrically-connectable device is aligned with the first electrical conductor;
 - forming a metallurgical bond between the first electrical conductor and the first electrode; and
 - filling the pocket with a material to protect the electrically-connectable device.
2. The method of claim 1 further comprising positioning a second electrical conductor longitudinally within a second conduit provided in the preform material.
3. The method of claim 2, wherein the at least one pocket further exposes the second electrical conductor and the electrically-connectable device is positioned within the pocket such that a second electrode on the electrically-connectable device is aligned with the second electrical conductor.
4. The method of claim 3 further comprising forming a metallurgical bond between the second electrical conductor and the second electrode.
5. The method of claim 1, wherein creating the pocket comprises removing preform material.
6. The method of claim 5, wherein removing preform material comprises using at least one of:
 - a laser; or
 - a milling machine.

7. The method of claim 1, wherein the pocket is filled with one or more of an encapsulant or a photocured epoxy.
8. The method of claim 1 further comprising minimizing fluctuation of an outer diameter of the drawn multi-material fiber.
9. The method of claim 1 further comprising, before the electrically-connectable device is positioned within the pocket, coating the first electrode with a bonding material.
10. The method of claim 1 further comprising interlacing the drawn multi-material fiber with a plurality of additional fibers to form a textile.
11. The method of claim 10 further comprising:
 - removing preform material in a first drawn multi-material fiber in the textile to expose electrical conductors of the first drawn multi-material fiber;
 - removing preform material in a second drawn multi-material fiber that, in the textile, intersects the first drawn multi-material fiber to expose electrical conductors of the second drawn multi-material fiber; and
 - interconnecting the electrical conductors of the first drawn multi-material fiber to the electrical conductors of the second drawn multi-material fiber.
12. The method of claim 11, wherein interconnecting the electrical conductors of the first drawn multi-material fiber to the electrical conductors of the second drawn multi-material fiber comprises inserting one or more of an interposer or a transposer therebetween.
13. A textile comprising:
 - (i) at least one multi-material fiber comprising:
 - a cladding material;
 - an electrically-connectable device disposed within the cladding material; and
 - a first electrical conductor disposed within the cladding material and in electrical communication with the electrically-connectable device;
 - (ii) a plurality of additional fibers interlaced with the multi-material fiber, wherein the electrically-connectable device and at least a portion of the first electrical conductor are disposed in a pocket filled with a filling material to protect the electrically-connectable device.

14. The textile of claim 13, wherein the multi-material fiber further comprises a second electrical conductor disposed within the cladding material and in electrical communication with the electrically-connectable device.
15. The textile of claim 13, wherein the filling material comprises one or more of an encapsulant or a photocured epoxy.
16. The textile of claim 13, wherein the electrically-connectable device is selected from the group consisting of a photodetector and a photodiode.
17. The textile of claim 13, wherein a first electrode of the electrically-connectable device is bonded to the first electrical conductor via a bonding material.
18. The textile of claim 13, wherein the cladding material is selected from the group consisting of a thermoplastic material, a thermoplastic elastomer, polyetherimide (PEI), and glass.
19. The textile of claim 13, wherein the first electrical conductor is selected from the group consisting of a copper wire, a copper wire comprising a silver coating, a tungsten wire, a high tension wire, and an extra high tension wire.
20. The textile of claim 13, wherein the first electrical conductor is located substantially along a neutral axis of the multi-material fiber.
21. The textile of claim 13, wherein the multi-material fiber has an aspect ratio between about 1.1:1 and about 2.7:1.
22. The textile of claim 13, wherein the multi-material fiber comprises an overcoating.
23. The textile of claim 22, wherein the overcoating comprises a thermoplastic elastomer material.
24. The textile of claim 13, wherein the multi-material fiber comprises an overwrap.
25. The textile of claim 24, wherein the overwrap comprises a plurality of high tensile strength fibers.
26. The textile of claim 25, wherein the high tensile strength fibers comprise one or more of aramids, dyneema, or basalt fibers.

27. The textile of claim 13, wherein the multi-material fiber further comprises a support wire to provide mechanical stability to the electrically-connectable device.
28. The textile of claim 13, wherein the multi-material fiber further comprises at least one outer wire.
29. The textile of claim 28, wherein the outer wire is located substantially along a neutral axis of the multi-material fiber.
30. The textile of claim 29, wherein the outer wire comprises one or more of a wire made from aramid, dyneema, or tungsten.