

CLAIMS

1. Apparatus for establishing optical connection between optical fibers, the apparatus comprising:

a first array comprising a plurality of slack management units (SMU), each having a holding socket for holding an optical end connector (OEC) of an optical fiber and configured to reel in a length of fiber released when the OEC is removed from the holding socket;

a second array comprising a plurality of coupling sockets, each configured to hold an optical end of an optical fiber;

a spatial barrier that partitions a volume of space containing the first and second arrays into first and second zones; and

a grabber configured to grab an OEC seated in a holding socket of any SMU in the first array, move the OEC through the first zone and plug the OEC into any coupling socket in the second array to establish an optical connection between the optical fiber connected to the OEC, and an optical end of an optical fiber held in the coupling socket so that the released length of fiber resides in the second zone.

2. The apparatus according to claim 1 wherein each SMU comprises a housing to which the holding socket is mounted and a slack management system configured to release the length of released fiber.

3. The apparatus according to claim 2 wherein each coupling socket is mounted to the housing of an SMU in the first array.

4. The apparatus according to claim 2 or claim 3 wherein the slack management system comprises a stationary pulley block and a sliding pulley block through which a portion of the fiber connected to the OEC is looped to provide a plurality of falls between the pulley blocks, and wherein the sliding pulley moves away from a first position in the SMU housing when the length of released fiber is released.

5. The apparatus according to claim 4 wherein the housing comprises a reel-in transmission operable to return the sliding pulley to the first position to reel in the released length of fiber.

6. The apparatus according to claim 5 and comprising a reel-in actuator operable to couple to the reel-in transmission and actuate the transmission to return the sliding pulley to the first position and reel in the length of released fiber.
7. The apparatus according to claim 6 wherein the reel-in transmission comprises a reel and a wire connected to the sliding pulley a portion of which wire is wound on the reel.
8. The apparatus according to claim 7 wherein the reel-in transmission comprises a rack and pinion coupled to the reel and operable to rotate the reel to wind the wire onto the reel to return the sliding pulley to the first position and reel in the length of released fiber.
9. The apparatus according to claim 8 wherein the reel-in actuator is configured to couple to and translate the rack to activate the reel-in transmission and wind the reel-in wire onto the reel to reel in the length of released fiber.
10. The apparatus according to any of claims 6-9 and comprising a rotator operable to rotate the grabber through a first azimuth angle about an axis of rotation to locate the grabber in a first position for which the grabber is operable to grab the OEC and through a second azimuth angle to locate the grabber in a position for which the grabber is operable to plug the OEC into the coupling socket.
11. The apparatus according to claim 10 wherein the rotator is operable to translate the grabber selectively in either direction along the axis of rotation to position the grabber jaws selectively in the first or second zone.
12. The apparatus according to claim 10 or claim 11 wherein the rotator is operable to rotate the reel-in actuator to locate the reel-in actuator in a position for which the reel-in actuator is operable to actuate the transmission to return the sliding pulley block to the first position and reel in the length of released fiber.

13. The apparatus according to claim 11 wherein the rotator comprises a shield surrounding the rotator and having an access slot parallel to the axis of rotation.
14. The apparatus according to claim 13 wherein the reel-in actuator comprises a rack and pinion operable to extend the rack through the slot to engage and actuate the reel-in transmission.
15. The apparatus according to claim 13 or claim 14 wherein the grabber comprises a pair of grabber jaws mounted to a rack of a rack and pinion operable to translate the rack to position the jaws in a position for which the jaws may be closed to grab the OEC.
16. The apparatus according to claim 15 wherein the rack and pinion of the grabber is operable to translate the rack of the grabber through the slot to position the jaws so that they may be closed to grab the OEC.
17. The apparatus according to any of the preceding claims wherein the first array is a circular array.
18. The apparatus according to any of the preceding claims wherein the OEC comprise a grab-fin to facilitate holding the OEC.
19. The apparatus according to claim 18 wherein the holding socket is configured to engage the grab-fin to rotationally align the OEC with the holding socket.
20. The apparatus according to claim 18 or claim 19 wherein the coupling socket is configured to engage the grab-fin to rotationally align the OEC with the holding socket.
21. The apparatus according to any of the preceding claims wherein the OEC comprises a RFID tag.
22. The apparatus according to any of the preceding claims wherein each coupling socket comprises a RFID tag.
23. The apparatus according to claim 21 or claim 22 wherein the grabber comprises a RFID reader operable to read the RFID tag.