CLAIMS

1. An endcap comprising:

   a. a first part, said first part being fused to an optical fiber at a proximal end of said first part, such that a main axis of said first part is defined as an axis that is in alignment with an optical axis of a beam guided through the optical fiber; and

   b. a second part connecting to said first part at a distal end of said first part, wherein said second part protrudes from said first part, such that said second part forms a protruding bonding area, which is perpendicular to said main axis, for attaching said endcap to a fixture attachment area of a fixture apparatus, said fixture attachment area is perpendicular to said main axis,

      wherein said endcap is inserted at least partially inside said fixture apparatus, whereby, said endcap keeps said optical fiber beam aligned and minimizes angular diversion from an original alignment.

2. The endcap of Claim 1, wherein said endcap and said fixture apparatus are held in a manner that the surface of the protruding bonding area of the endcap is bonded to the counter facing surface of the fixture attachment area by a bonding material in a manner that allows thermal expansion movements of said bonding material along said optical axis.

3. The endcap according to claim 1, wherein said second part is lens-shaped at a distal end thereof, forming a collimator for collimating the optical fiber beam.

4. The endcap according to any one of claims 1 and 3, wherein said second part comprises:
   - a body symmetrically arranged about said main axis; and

- at least one protruding member integrally connected to said body, over an outer periphery of said body, said at least one protruding member protrudes perpendicularly to said main axis,
  wherein said protruding member forms the bonding area of said second part.

5. The endcap according to claim 4, wherein said at least one protruding member of said second part is a single annular ring connected to the outer periphery of said body.

6. The endcap according to claim 4, wherein said protruding member of said second part comprises multiple protruding wings each forming a bonding area, which is perpendicular to said main axis, wherein said protruding wings are symmetrically arranged about said main axis and are spaced from one another.

7. The endcap according to any one of claims 4-6, wherein said body of said second part has a lensed shaped edge for collimating the optical fiber beam.

8. The endcap according to any one of claims 4-6, wherein said body of said second part is cylindrical having flattened edges.

9. The endcap according to any one of claims 1 to 8, wherein all parts of said endcap form a single piece made of the same material.

10. The endcap according to claim 9, wherein said endcap is made of a transparent material.

11. The endcap according to claim 10, wherein said bonding material is one of the list of: silicon based material, SiO_2, UV curable material, BK7, fluoride based glass, Caf, Chalcogenide based glasses, AsS, AsSe.

12. The endcap according to any one of claims 1 to 11, wherein said endcap is coreless.

13. The endcap according to claim 1, wherein at least one of said first and second parts is an optical waveguide.

14. The endcap according to any one of claims 1 to 13, wherein at least the part of said second part forming the protruding bonding area is furrowed or roughened for improving adhering of the endcap to another element.

15. The endcap according to any one of claims 1 to 14, wherein the maximum diameter of the endcap is between 0.2mm to 10mm.

16. The endcap according to any one of claims 1 to 15, wherein the length of the protruding bonding area of said second part, taken from the main axis is equal to or higher than twice the radius of the optical fiber.

17. An assembly for optical fibers, said assembly comprising:

(i) a fixture apparatus comprising at least one fixture attachment area of a fixture apparatus; and

(ii) an endcap comprising:

- a first part, said first part being fused to an optical fiber at a proximal end of said first part, such that a main axis of said first part is in alignment with an optical axis of a beam guided through the optical fiber; and
- a second part connecting to a distal end of said first part, said second part comprises a body and a protruding member which protrudes from said first part forming thereby a protruding bonding area, which is perpendicular to the main axis for attaching said endcap to the fixture attachment area of a fixture apparatus, said fixture attachment area is perpendicular to said main axis,

wherein said endcap is inserted at least partially inside said fixture apparatus, whereby, said endcap maintains said optical fiber beam aligned and minimizes angular diversion from an original alignment.

18. The assembly of claim 17, wherein said protruding bonding area of said endcap second part and the fixture attachment area of said fixture apparatus are counter facing, forming an engagement area and are bonded to one another using a bonding material.

19. The assembly according to any one of claims 17 to 18, wherein said endcap and the fixture attachment area of said fixture apparatus are configured for attaching by interlocking to one another.

20. The assembly according to any one of claims 17 to 19, wherein said second part of said endcap comprises an annular structure which is coaxially arranged about the main axis forming said protruding bonding area.

21. The assembly according to claim 20, wherein said body being coaxially arranged about the main axis.

22. The assembly according to claim 21, wherein said body is lensed shaped for collimating the fiber output beam.

23. The assembly according to any one of claims 20 to 22, wherein said first part is smaller in diameter than said body.

24. The assembly according to any one of claims 17 to 23, wherein all parts of said endcap form a single piece made of a transparent or semi-transparent material.

25. The assembly according to claim 24, wherein said endcap is made from glass or any other Silicon based material.

26. The assembly according to any one of claims 17 to 25, wherein said fixture apparatus further comprises holes for receiving therein removable shims, said holes are separated from one another, wherein each of said holes is located such that once the endcap is inserted into the fixture apparatus, shims can be removably placed in the holes to mechanically fixate an equal vertical distance along the main axis in a gap formed between said bonding area of said endcap and the fixture attachment area of the fixture apparatus.

27. The assembly according to any one of claims 17 to 26, wherein said fixture apparatus further comprises at least one duct directed to said engagement area for inserting a bonding material to said engagement area therethrough, for bonding said endcap to said fixture apparatus.

28. The assembly according to claim 27, wherein an ingress of each of said at least one duct is located below or above said engagement area and directed to said engagement area having an egress located at the engagement area.

29. The assembly according to any one of claims 27 to 28, wherein the inner wall of said fixture apparatus comprises niches in areas in which the bonding material is to be inserted for allowing expansion of the bonding material outwardly in respect to said main axis for preventing vertical expansion thereof.

30. A method comprising:
    a. providing an endcap and a fixture apparatus, said endcap being fused to one end of an optical fiber,

wherein said endcap comprises at least one protruding part forming a protruding bonding area that is positioned perpendicularly in respect to an optical axis of the optical fiber attached thereto, wherein the optical axis is defined by the direction of propagation of light guided through the optical fiber;

b. engaging the protruding bonding area of the endcap to at least one counter facing fixture attachment area of a fixture apparatus, said fixture attachment area is perpendicular to said optical axis;
c. inserting a bonding material to said engagement area for bonding said endcap to said fixture apparatus,

whereby, mounting said endcap in a manner that maintains said optical fiber beam aligned and minimizes angular diversion from an original alignment.

31. The method according to claim 30, wherein said insertion of the bonding material to said engagement area is done via at least one duct in said fixture apparatus.

32. The method according to any one of claims 30 to 31 further comprising the step of mechanically maintaining the alignment between said fixture apparatus and said endcap while said bonding material is hardened by maintaining an equal distance “d” between the bonding area of said endcap and the counter-facing area of said protrusion of said fixture apparatus throughout the periphery of said engagement area in respect to the main axis of said endcap.

33. The method according to claim 32 further comprising:

- inserting shims into holes in said fixture apparatus for mechanically maintaining the equal distance “d”, said holes are separated from one another;

- removing the shims once the bonding material is hardened after the step of the insertion of the bonding material.

34. The method according to claim 33, wherein said shims are equal in shape and size.

35. The method according to claim 30 further comprising the step of performing a durability test of the endcap and fixture alignment, after the bonding of said endcap to said fixture apparatus for testing the durability of the optical alignment between said fixture apparatus and said endcap, under one extreme influences.

36. The method according to claim 35, wherein said extreme influences used for the durability test is at least one of: extreme temperatures; extreme trembling or vibrating conditions.

37. The method according to claim 36, wherein said durability test is done using at least one optical system, wherein light is propagated through said optical fiber connecting to said endcap and beam outputted from said endcap is compared to a reference beam for detecting alignment accuracy rate of said endcap once bonded to said fixture apparatus.