CLAIMS

1. An optical assembly, comprising:

an optical ferrule configured to receive light from an optical waveguide and comprising at least three ferrule alignment features; and

a cradle securing the optical ferrule therein and configured to align the optical ferrule to an optical component, the cradle comprising at least four cradle alignment features configured to make contact or near contact with the at least four ferrule alignment features in a one to one correspondence in at least four corresponding contact regions, such that as a temperature of at least one of the cradle and the optical ferrule changes sufficiently, the corresponding alignment features of the optical ferrule and the cradle slide relative to each other causing the corresponding alignment features of the optical ferrule and the cradle to move to define corresponding traversed regions, such that when extended, the traversed regions of the at least four ferrule alignment features and the at least four cradle alignment features pass within 20 microns of a same first point.

2. The optical assembly of claim 1, wherein the optical ferrule is configured to receive light from an optical waveguide along a first direction and redirect the received light along a different second direction.

3. The optical assembly of claim 1, wherein at at least a room temperature, each pair of corresponding ferrule and cradle alignment features make near contact with each other, the near contact defining a clearance gap at the contact region between the ferrule and cradle alignment features.

4. The optical assembly of claim 1, wherein at at least one temperature, at least one pair of corresponding ferrule and cradle alignment features make near contact with each other, and at least one other pair of corresponding ferrule and cradle alignment features make contact with each other.

5. The optical assembly of claim 1, wherein at least one traversed region is substantially a line, such that when extended, the line passes within 10 microns of the first point.

6. The optical assembly of claim 1, wherein the traversed regions of the at least four ferrule alignment features and the at least four cradle alignment features pass within 10 microns of the first point.

7. The optical assembly of claim 1, wherein all the traversed regions are substantially planes, such that when extended, each plane passes within 10 microns of the first point.

8. The optical assembly of claim 1, such that within a predetermined operational temperature range of the optical assembly, contacts or near contacts between the at least four ferrule and cradle alignment surfaces substantially prevent relative lateral movement between the optical ferrule and the cradle.

9. The optical assembly of claim 1, wherein at least one ferrule alignment feature in the at least four ferrule alignment features is substantially perpendicular to a thickness direction of the ferrule.

10. The optical assembly of claim 1, wherein at least two ferrule alignment features in the at least four ferrule alignment features are substantially perpendicular to each other.

11. The optical assembly of claim 1, wherein at least one cradle alignment feature in the at least four ferrule alignment features is substantially perpendicular to a thickness direction of the cradle.

12. The optical assembly of claim 1, wherein at least two cradle alignment features in the at least four cradle alignment features are substantially perpendicular to each other.

13. The optical assembly of claim 1, wherein the coefficients of thermal expansion of the optical ferrule and the cradle are different by at least a factor of 2.

14. An assembly comprising:

a first element having a first coefficient of thermal expansion C1; and

a second element having a second coefficient of thermal expansion C2, $C2 \leq 0.5\ C1$, the first and second elements making at least four contacts or near contacts with each other in at least four corresponding contact regions, the contacts or near contacts keeping the first element substantially secured relative to the second element over at least a predetermined operational temperature range of the assembly, such that as a temperature of at least one of the first and second elements changes sufficiently, the at least four contact regions move to define at least four corresponding traversed regions, such that when extended, the traversed regions pass within 20 microns of a same first point.

15. An optical ferrule configured to receive a central light ray from an optical fiber bonded to the optical ferrule along a first direction and redirect the received central light ray along a different second direction as a redirected central light ray, the optical ferrule configured to be substantially secured within a cradle by virtue of making a plurality of surface contacts or near contacts with the cradle, such that when extended, the plurality of surface contacts or near contacts and the redirected central light ray pass within 20 microns of a same first point.

16. An optical ferrule configured to receive a central light ray from an optical fiber bonded to the optical ferrule along a first direction and redirect the received central light ray along a different second direction as a redirected central light ray, the optical ferrule configured to be substantially secured within a cradle by virtue of making a plurality of line contacts or near contacts with the cradle, such that as a temperature of optical ferrule changes sufficiently, the line contacts move to define corresponding traversed regions, such that when extended, the traversed regions and the redirected central light ray pass within 20 microns of a same first point.

17. An optical assembly, comprising:

an optical ferrule configured to receive light from an optical waveguide and comprising at least four ferrule alignment features; and

a cradle securing the optical ferrule therein and configured to align the optical ferrule to an optical component, the cradle comprising at least four cradle alignment features configured to make contact or near contact with the at least four ferrule alignment features in a one to one correspondence in at least four corresponding contact regions, such that when a size of at least one of the cradle and the optical ferrule changes sufficiently, the corresponding alignment features of the optical ferrule and the cradle slide relative to each other causing the corresponding alignment features of the optical ferrule and the cradle to move to define corresponding traversed regions, such that when extended, the traversed regions of the at least four ferrule alignment features and the at least four cradle alignment features pass within 20 microns of a same first point.

18. An optical ferrule configured to be substantially secured within a cradle by virtue of making at least four surface contacts or near contacts with the cradle with at least four of the at least four surface contacts or near contacts not being coplanar, such that when extended, the at least four surface contacts or near contacts pass within 20 microns of a same first point.

19. An optical assembly, comprising:

an optical ferrule configured to receive light from an optical waveguide and comprising at least four non-coplanar ferrule alignment surfaces that when extended, pass within 10 microns of a first point; and

a cradle securing the optical ferrule therein and configured to align the optical ferrule to an optical component, the cradle comprising at least four non-coplanar cradle alignment surfaces that when extended, pass within 10 microns of a second point, such that within a predetermined operational temperature range of the optical assembly, the first and second points remain within 20 microns of each other.

20. An assembly comprising:

A first element comprising at least four first alignment features; and

a second element securing the first element therein, the second element comprising at least four second alignment features configured to make contact or near contact with the at least four first alignment features in a one to one correspondence in at least four corresponding contact regions, such that when a size of at least one of the first and second elements changes sufficiently, the corresponding alignment features of the first and second elements slide relative to each other causing the corresponding alignment features of the first and second elements to move to define corresponding traversed regions, such that when extended, the traversed regions of the at least four first alignment features and the at least four second alignment features pass within 20 microns of a same first point.