

CLAIMS

What is claimed is:

1. An intercooler assembly comprising:
a housing defining an internal space, an inlet and an outlet;
a first plastic tube plate;
a second plastic tube plate; and
a plurality of plastic tubes attached at distal ends to the first tube plate and the second tube plate; wherein the plurality of tubes are attached to at least one of the first tube plate and the second tube plate by a laser welded joint.
2. The assembly as recited in claim 1, wherein the outlet comprises plastic material that is attached to the housing.
3. The assembly as recited in claim 1, wherein the inlet comprises a metal material that is attached to the housing.
4. The assembly as recited in claim 3, including a plastic retaining ring attached to the housing to retain the metal inlet attached to the housing.
5. The assembly as recited in claim 1, including a first coolant tank disposed adjacent the first tube plate and a second coolant tank disposed adjacent the second coolant tank.

6. The assembly as recited in claim 1, wherein the housing comprises a cylinder.
7. The assembly as recited in claim 6, including a water jacket surrounding the cylindrical housing.
8. The assembly as recited in claim 7, wherein the water jacket is cylindrical and is spaced a radial distance from the cylindrical housing and a first coolant tank and a second coolant tank are defined in the radial distance between the cylindrical housing and cylindrical water jacket.
9. The assembly as recited in claim 1, wherein at least one end of each of the plurality of tubes includes a flange overlapping a portion of a corresponding one of the first and second tube plates and the laser weld joint is formed between the flange and the tube plate.
10. The assembly as recited in claim 9, wherein the flange is disposed at an angle relative to a centerline of the tube that is less than 90 degrees.
11. The assembly as recited in claim 1, wherein the inlet and outlet are disposed on a common side of the housing.
12. The assembly as recited in claim 1, including a spreader for spacing the plurality of tubes a desired distance from each other.

13. The assembly as recited in claim 1 wherein each of the plurality of tubes extends in a spiral between the first tube plate and the second tube plate.

14. The assembly as recited in claim 1, wherein each of the plurality of tubes extends in a U-shape between the first tube plate and the second tube plate.

15. The assembly as recited in claim 13, wherein an intermediate portion of at least one of the plurality of tubes is attached to one of the first tube plate and the second tube plate by a laser welded joint.

16. A method of fabricating an intercooler assembly comprising the steps of:
- a) inserting a first end of a tube through a first opening in a first tube plate;
 - b) inserting a second end of the tube through a second opening in a second tube plate;
 - c) laser welding at least one of the first end and second end of the tube to a corresponding one of the first tube plate and the second tube plate;
 - c) housing the tube, the first tube plate, and second tube plate within a housing;
 - d) attaching an inlet to the housing; and
 - e) attaching an outlet to the housing.
17. The method as recited in claim 16 including laser welding the outlet to the housing.
18. The method as recited in claim 16 including laser welding a retaining ring to the housing for securing a metal inlet to the housing.
19. The method as recited in claim 1, wherein one of the first and second ends of the tube include a flange and the step of laser welding comprises laser welding the tube flange to the tube plate.
20. The method as recited in claim 16, wherein the step of laser welding the tube flange to the tube plate includes the step of forming a flange in the tube and pressing the flange against the tube plate.

21. The method as recited in claim 16 comprises pressing a form into an end of one of the first and second tube ends to form the flange and passing laser energy through the form during the laser welding step.

22. The method as recited in claim 21, wherein the form comprises a spherical surface that is pressed into an end of the tube.

23. The method as recited in claim 21, further comprising pressing a plurality of forms into a corresponding plurality of tube ends and passing laser energy through the plurality of forms at the same time.

24. A method of attaching a plastic tube to a plastic tube plate comprising the steps of:

- a) inserting an end of a tube into an opening of the tube plate;
- b) pressing on the end of the tube with a form to generate a flange pressed against a surface of the tube plate; and
- c) laser welding the flange to the tube plate.

25. The method as recited in claim 24, wherein the form includes a spherical surface that forms a flange less than 90 degrees from a centerline of the tube.

26. The method as recited in claim 25, wherein the form comprises a material substantially transparent to laser energy.

27. The method as recited in claim 25, wherein laser energy is directed through the form to weld the flange to the tube plate while the form is pressing the flange against the tube plate.

28. The method as recited in claim 27, including a biasing member for biasing the form into the tube and against the surface of the tube plate.

29. The method as recited in claim 24, wherein the form comprises a glass ball.

30. The method as recited in claim 24, wherein the form comprises a spherical surface formed on a surface of a glass plate.