CLAIMS

We claim:

1. A plural component spraying system comprising:

a set of ratio proportioning pumps for delivering two or more respective components of a plural component fluid formulation under pressure;

a heating system to heat said respective fluid components;

a mixing and dispensing apparatus into which said respective fluid components enter under pressure which includes an impingement mixing element, a backpressure element, a static mixer housing that contains one or more static mixing elements and an orifice portion from which mixed material is dispensed;

wherein

said impingement mixing element of said mixing and dispensing apparatus has entry ports and a mixing chamber configured such that said respective fluid components enter under pressure and initially mix by impingement mixing;

said orifice portion of said mixing and dispensing apparatus is located downstream of said static mixer housing;

said backpressure element is located between the respective fluid component entry ports of the impingement mixing element and said orifice portion;

the static mixer housing is easily and quickly removable to facilitate replacement of the static mixing element(s);

said system further comprising

a device for observing and adjusting the pressures developed by said set of ratio proportioning pumps;

temperature controllers for said fluid components;

a device for setting and maintaining a set ratio between said proportioning pumps.

2. The system as claimed in claim 1 in which the temperatures are in the range of 15 to 100 degrees C.

3. The system as claimed in claim 1 in which the pressures are in the range of 1,700 to 70,000 kPa.

4. The system as claimed in claim 1 in which the ratio can be set using a variable ratio machine by adjusting the ratio or using a fixed ratio machine by reconfiguring the ratio mechanically.

5. The system as claimed in claim 1 in which the proportioning pump set is comprised of hydraulically or pneumatically driven cylinders, gear pumps, piston pumps, peristaltic pumps, diaphragm pumps or other positive displacement pumps.

6. The system as claimed in claim 1 in which the static mixing element(s) is (are) made of a material that can be easily drilled out.

7. The system as claimed in claim 1 in which the temperature of the fluid components can be individually controlled.

8. The system as claimed in claim 1 in which the orifice portion is an injection or pouring orifice.

9. The system as claimed in claim 1 in which an air purge is used to keep the impingement mixing chamber cleared of mixed material at the end of each operational cycle.

10. The system as claimed in claim 1 in which the spray gun weighs less than 1.5 kg.

11. The system as claimed in claim 1 in which the static mixing elements can be removed from the static mixer housings other than by drilling such as by using heat to melt, bake or burn them out, or force to push them out and/or a small amount of solvent, less than 1 liter, can also be used to aid in the process of removing said elements.

12. The system as claimed in claim 1 in which the orifice portion is a spray nozzle.

13. A method of dispensing a plural component thermoplastic or thermosetting material, said method comprising

delivering two or more respective components of a plural component fluid formulation under pressure to the mixing and dispensing apparatus of claim 1;

heating said respective fluid components;

mixing said respective fluid components by impingement mixing in the impingement mixing chamber;

further mixing said components in the static mixer housing that contains one or more static mixing elements; and

dispensing mixed material with the orifice portion.

14. The method of claim 13, further comprising periodically removing the static mixer housing and replacing the static mixing element(s).

15. The method of claim 13, further comprising observing and adjusting the pressures developed by said set of ratio proportioning pumps.

16. The method of claim 13, further comprising setting and maintaining a set ratio between said proportioning pumps.

17. The method of claim 13 further comprising adding a catalyst or catalysts to the fluid components to increase reaction rates and shorten curing times.

18. An article of manufacture made by the process of claim 13.

## CLAIMS

1. A plural component spraying system comprising:

a set of ratio proportioning pumps for delivering two or more respective components of a plural component fluid formulation under pressure;

a heating system to heat said respective fluid components;

a mixing and dispensing apparatus into which said respective fluid components enter under pressure which includes an impingement mixing element, a backpressure element, a static mixer housing that contains one or more static mixing elements and an orifice portion from which mixed material is dispensed;

wherein

said impingement mixing element of said mixing and dispensing apparatus has entry ports and a mixing chamber configured such that said respective fluid components enter under pressure and initially mix by impingement mixing;

said orifice portion of said mixing and dispensing apparatus is located downstream of said static mixer housing;

said backpressure element is located between the respective fluid component entry ports of the impingement mixing element and said orifice portion;

the static mixer housing is easily and quickly removable to facilitate replacement of the static mixing element(s);

said system further comprising temperature controllers for said fluid components;

a device for setting and maintaining a set ratio between said proportioning pumps.

2. The system as claimed in claim 1 in which the temperatures are in the range of 15 to 100 degrees C. and the temperature of the fluid components can be individually controlled.

3. The system as claimed in claim 1 in which the pressures are in the range of 1,700 to 70,000 kPa.

4. The system as claimed in claim 1 in which the static mixing element(s) is (are) made of a material that can be easily drilled out or in which the static mixing elements can be removed from the static mixer housings by using heat to melt, bake or burn them out, or force to push them out, and/or less than 1 liter of solvent can also be used to aid in the process of removing said elements.

5. The system as claimed in claim 1 in which the orifice portion is an injection or pouring orifice.

6. The system as claimed in claim 1 further comprising a gun housing which is slidable with respect to the static mixer housing into a dispensing position wherein connection block ports in the gun housing are in communication with the entry ports, and into a purging position wherein an air purge port in the gun housing is in communication with the entry ports, and the air purge is used to keep the impingement mixing chamber cleared of mixed material at the end of each operational cycle.

7. The system as claimed in claim 1 in which the spray gun weighs less than 1.5 kg.

8. The system as claimed in claim 1 in which the orifice portion is a spray nozzle.

9. A method of dispensing a plural component thermoplastic or thermosetting material, said method comprising

delivering two or more respective components of a plural component fluid formulation to the plural component spraying system of claim 1;

heating said respective fluid components;

mixing said respective fluid components by impingement mixing in the impingement mixing chamber;

further mixing said components in the static mixer housing that contains one or more static mixing elements; and

dispensing mixed material with the orifice portion.

10. The method of claim 9, further comprising periodically removing the static mixer housing and replacing the static mixing element(s).

11. The method of claim 9, further comprising observing and adjusting the pressures developed by said set of ratio proportioning pumps.

12. The method of claim 9, further comprising setting and maintaining a set ratio between said proportioning pumps, and wherein the volumetric ratio of the respective fluid components is greater than 4:1.

13. The method of claim 9 further comprising adding a catalyst or catalysts to the fluid components to increase reaction rates and shorten curing times.

14. An article of manufacture made by the process of claim 9.

15. The method of claim 9, wherein the diameter of the entry port used for a lower viscosity fluid component is less than the diameter of the entry port used for a higher viscosity fluid component, such that the difference in pressure between the fluid components is not more than 7,000 kPa.

16. The system as claimed in claim 1 in which the backpressure element is between the impingement mixing element and the static mixer housing, and the backpressure element is an insert that fits into the impingement mixing element and is fastened into place by screwing the static mixer housing onto the end of the impingement mixing element.

17. The system as claimed in claim 1 in which the impingement mixer has a cylindrical mixing chamber and the backpressure element has a cylindrical port, the diameters of which are less than that of the static mixer housing.

18. The system as claimed in claim 1 in which the center lines of the impingement mixer entry ports are offset from each other and from the center line of the impingement mixing chamber, and one of the entry ports has a larger diameter than the other.

19. The system as claimed in claim 1 in which the static mixer housing has a long bore and a smaller bore, wherein the static mixer element(s) fits and resides in the long bore but not in the smaller bore, which smaller bore has a smaller diameter than the long bore.