CLAIMS

1. A flow substrate comprising:

a substrate body formed from a solid block of a first material, the substrate body having a first surface and a second surface opposing the first surface;

a plurality of pairs of component conduit ports defined in the first surface of the substrate body;

a plurality of fluid pathways extending between each respective pair of component conduit ports and in fluid communication with each component conduit port of the respective pair of component conduit ports, each respective fluid pathway being formed in the second surface of the substrate body; and

at least one cap formed from a second material, the at least one cap having a first surface that is constructed to seal at least one fluid pathway of the plurality of fluid pathways, and a second surface opposing the first surface of the at least one cap;

wherein ~~at least one of~~ the substrate body ~~and the at least one cap~~ includes a weld formation formed in ~~at least one of~~ the second surface of the substrate body and ~~the second surface of the at least one cap, the weld formation being constructed to~~ surrounding the at least one fluid pathway ~~and~~ to facilitate welding of the at least one cap to the substrate body along the weld formation, the weld formation including a recessed flat wall surface surrounding the at least one fluid pathway and a swaged lip, the recessed flat wall surface being recessed from the second surface of the substrate body and having an inner edge and an outer edge, and the swaged lip being disposed adjacent the inner edge of the recessed flat wall surface.

2. The flow substrate of claim 1, wherein the component conduit ports extend through the substrate body to the second surface of the substrate body.

3. The flow substrate of claim 1, wherein the first material and the second material are stainless steel of the same alloy type.

~~4. The flow substrate of claim 1, wherein the substrate body includes a first weld formation formed in the second surface of the substrate body and wherein the at least one cap includes a second weld formation formed in the second surface of the at least one cap.~~

~~5. The flow substrate of claim 1, wherein the at least one cap includes the weld formation, the weld formation including a groove formed in the second surface of the at least one cap.~~

~~6. The flow substrate of claim 5, wherein the groove is formed in the second surface of the at least one cap by chemical etching.~~

~~7. The flow substrate of claim 5, wherein the groove facilitates welding of the at least one cap to the substrate body by identifying the location of where the at least one cap is to be welded to the substrate body and by reducing the power needed to weld the at least one cap to the substrate body.~~

~~8. The flow substrate of claim 1, wherein the at least one cap includes a plurality of weld formations, each weld formation of the plurality of weld formations including a respective groove formed in the second surface of the at least one cap, each respective groove of the plurality of grooves surrounding a respective one of the plurality of fluid pathways.~~

~~9. The flow substrate of claim 1, wherein the at least one cap includes a plurality of caps corresponding to each of the plurality of fluid pathways, each respective cap of the plurality of caps including a respective groove formed in the second surface of the respective cap.~~

~~10. The flow substrate of claim 1, wherein the substrate body includes the weld formation formed in the second surface of the substrate body, the weld formation including a recessed weld wall surface surrounding the at least one fluid pathway.~~

~~11~~4. The flow substrate of claim ~~10~~, wherein the weld formation further includes a stress relief groove surrounding the outer edge of the recessed ~~weld~~ flat wall surface.

~~12. The flow substrate of claim 10, wherein the weld formation further includes a swaged lip surrounding the at least one fluid pathway and disposed between the at least one fluid pathway and the recessed weld wall surface.~~

~~13. The flow substrate of claim 12, where the weld formation further includes a stress relief groove surrounding the recessed weld wall surface.~~

~~14~~5. The flow substrate of claim 1, wherein the flow substrate forms a portion of a gas stick for conveying one of semiconductor process fluids and sampling fluids and petrochemical fluids.

~~15~~6. The flow substrate of claim 1, wherein the flow substrate forms substantially all of a fluid delivery panel.

~~16~~7. The flow substrate of ~~any of~~ claims 1-~~15~~, wherein a first fluid pathway of the plurality of fluid pathways has a different cross-sectional area than a second fluid pathway of the plurality of fluid pathways.

~~17~~8. The flow substrate of ~~any of~~ claims 1-~~16~~, wherein the plurality of fluid pathways are a first plurality of fluid pathways that extend between each respective pair of component conduit ports in a first direction, and wherein the flow substrate further includes at least one second fluid pathway formed in one of the first surface and the second surface of the substrate body that extends in a second direction that is transverse to the first direction.

~~18. A flow substrate comprising:~~

~~a substrate body formed from a solid block of a first material, the substrate body having a first surface and a second surface opposing the first surface;~~

~~a plurality of pairs of component conduit ports defined in the first surface of the substrate body;~~

~~a plurality of fluid pathways extending between each respective pair of component conduit ports and in fluid communication with each component conduit port of the respective pair of component conduit ports, each respective fluid pathway being formed in the second surface of the substrate body;~~

~~a plurality of seals corresponding to each of the plurality of fluid pathways; and~~

~~at least one cap formed from a second material, the at least one cap having a first surface that is constructed to seal at least one fluid pathway of the plurality of fluid pathways, and a second surface opposing the first surface of the at least one cap;~~

~~wherein the at least one cap is configured to receive and retain at least one seal of the plurality of seals in registration with the at least one cap and to form a fluid tight seal with the at least one fluid pathway upon compression against the substrate body.~~

~~19. The flow substrate of claim 18, wherein the component conduit ports extend through the substrate body to the second surface of the substrate body.~~

~~20. The flow substrate of claim 18, wherein the first material and the second material are plastic.~~

~~21. The flow substrate of claim 18, wherein the first material is plastic, and the second material is metal.~~

~~22. The flow substrate of claim 18, wherein the at least one cap includes a groove formed in the first surface of the at least one cap and dimensioned to retain the at least one seal.~~

~~23. The flow substrate of claim 22, wherein the groove is formed in the first surface of the at least one cap by one of molding and machining.~~

~~24. The flow substrate of claim 18, wherein the at least one cap includes a plurality of grooves formed in the first surface of the at least one cap, each respective groove of the plurality of grooves being dimensioned to retain a respective seal of the plurality of seals.~~

~~25. The flow substrate of claim 18, wherein the at least one cap includes a plurality of caps corresponding to each of the plurality of fluid pathways, each respective cap of the plurality of caps being configured to receive and retain a respective seal of the plurality of seals between the first and second surfaces of the respective cap.~~

~~26. The flow substrate of claim 25, wherein the first and second surfaces of each respective cap are separated by an intermediate portion of the respective cap, the intermediate portion having a smaller cross-sectional extent than either of the first and second surfaces of the respective cap.~~

~~27. The flow substrate of claim 26, wherein the first and second surfaces of each respective cap are dimensioned to be the same.~~

~~28. The flow substrate of claim 18, further comprising a plate formed from a rigid material and constructed to be disposed adjacent the second surface of the at least one cap and to compress the at least one cap against the substrate body.~~

~~29. The flow substrate of any of claims 18-28, wherein a first fluid pathway of the plurality of fluid pathways has a different cross-sectional area than a second fluid pathway of the plurality of fluid pathways.~~

~~30. The flow substrate of any of claims 18-28, wherein the plurality of fluid pathways are a first plurality of fluid pathways that extend between each respective pair of component conduit ports in a first direction, and wherein the flow substrate further includes~~

~~at least one second fluid pathway formed in one of the first surface and the second surface of the substrate body that extends in a second direction that is transverse to the first direction.~~

9. The flow substrate of claim 1, wherein the swaged lip extends from the recessed flat wall surface and toward the second surface of the substrate body but does not extend past the second surface of the substrate body.

10. The flow substrate of claim 1, wherein the recessed flat wall surface is recessed from the second surface of the substrate body by a distance sufficient to allow a weld formed between the at least one cap and the substrate body to be recessed from the second surface of the substrate body without any further surface preparation of the weld.

11. The flow substrate of claim 10, wherein the swaged lip extends from the recessed flat wall surface and toward the second surface of the substrate body but does not extend past the second surface of the substrate body.

12. The flow substrate of claim 11, wherein the weld formation further includes a weld edge formed in the second surface of the substrate body surrounding the at least one fluid pathway and dimensioned to receive the at least one cap.

13. The flow substrate of claim 12, where the weld formation further includes a stress relief groove surrounding the outer edge of the recessed flat wall surface.

14. The flow substrate of claim 1, wherein the at least one cap includes a plurality of caps corresponding to each of the plurality of fluid pathways.

15. The flow substrate of claim 14, wherein the substrate body includes a plurality of weld formations formed in the second surface of the substrate body, each respective weld formation of the plurality of weld formations surrounding a respective fluid pathway of the plurality of fluid pathways, each respective weld formation including a respective recessed flat wall surface surrounding the respective fluid pathway and a respective swaged lip.

16. The flow substrate of claim 15, wherein each respective weld formation further includes a stress relief groove surrounding the respective recessed flat wall surface.