

CLAIMS

What is claimed is:

1. A system comprising:
 - a semiconductor processing chamber having a plurality of processing stations, each processing station including a station inlet;
 - a plurality of manifold trunks, wherein each manifold trunk is fluidically connected to a corresponding processing station and includes:
 - an outlet fluidically connected to the station inlet of the corresponding processing station,
 - a common flowpath fluidically connected to the outlet,
 - a plurality of trunk inlets fluidically connected to the common flowpath such that fluid flows from each trunk inlet to the outlet via the common flowpath,
 - a plurality of orifices, each orifice having an orifice body and a hole extending through the orifice body, and each orifice fluidically connected to a corresponding trunk inlet such that each trunk inlet is fluidically interposed between a corresponding orifice and the common flowpath, and
 - a plurality of valve interfaces, each valve interface corresponding to each orifice of the manifold trunk,
 - a plurality of valves, each valve interfaced with a corresponding valve interface of each manifold trunk; and
 - a plurality of fluid manifolds, wherein:
 - each fluid manifold has a common input fluidically connected to a plurality of legs,
 - for each fluid manifold, each leg:
 - is fluidically connected to a different one of the manifold trunks than the other legs, and
 - has a termination point fluidically connected to a corresponding orifice at each one of the manifold trunks such that the corresponding orifice is fluidically interposed between the termination point and the corresponding manifold inlet,
 - and
 - each valve is configured to regulate fluid flow between one corresponding leg and the corresponding orifice.

2. The system of claim 1, wherein one of the manifold trunks further includes an orifice plate, wherein:
 - the orifice plate includes one orifice and one valve interface of the manifold trunk,
 - one of the valves is interfaced with the valve interface of the orifice plate, and
 - the orifice plate is interposed between the one valve and the trunk inlet that corresponds to the one orifice.
3. The system of claim 2, wherein each manifold trunk further includes a plurality of orifice plates, wherein:
 - each orifice plate includes one corresponding orifice and one corresponding valve interface of the manifold trunk,
 - each valve is interfaced with the valve interface of a corresponding orifice plate, and
 - each orifice plate is interposed between each corresponding valve and one of the trunk inlets that corresponds to the corresponding orifice.
4. The system of claim 2, wherein the orifice is swaged into the orifice plate.
5. The system of claim 2, wherein the orifice plate is removably connected to the manifold trunk.
6. The system of claim 1, wherein the orifice body comprises ruby.
7. The system of claim 1, wherein:
 - each manifold leg includes a delivery line with an inner diameter, and
 - each hole of each orifice has a diameter that is less than 40% of the inner diameter.
8. The system of claim 7, wherein each hole of each orifice has a diameter that is less than 20% of the inner diameter.
9. The system of claim 1, wherein:
 - each valve interface is a surface mount interface, and
 - each valve is a surface mount valve.

10. The system of claim 1, wherein:
each manifold leg terminates at a corresponding valve, and
the corresponding valve is fluidically connected to the orifice.
11. The system of claim 1, wherein each manifold leg terminates at a corresponding valve interface.
12. The system of claim 1, wherein the manifold trunk is positioned outside the processing chamber.
13. The system of claim 1, wherein the legs of each manifold are substantially the same length.
14. The system of claim 1, wherein:
the semiconductor processing chamber includes a first processing station and a second processing station,
the plurality of manifold trunks includes a first manifold trunk and a second manifold trunk,
the plurality of manifolds includes a first manifold and a second manifold, each manifold having two legs,
the first manifold trunk is fluidically connected to a first station inlet of the first processing station,
the second manifold trunk is fluidically connected to a second station inlet of the second processing station,
a first leg of the first manifold is fluidically connected to a first trunk inlet of the first manifold trunk such that a first orifice of the first manifold trunk is fluidically interposed between the first trunk inlet of the first manifold trunk and a termination point of the first leg of the first manifold,
a second leg of the first manifold is fluidically connected to a first trunk inlet of the second manifold trunk such that a first orifice of the second manifold trunk is fluidically interposed between the first trunk inlet of the second manifold trunk and a termination point of the second leg of the first manifold,

a first leg of the second manifold is fluidically connected to a second trunk inlet of the first manifold trunk such that a second orifice of the first manifold trunk is fluidically interposed between the second trunk inlet of the first manifold trunk and a termination point of the first leg of the second manifold, and

a second leg of the second manifold is fluidically connected to a second trunk inlet of the second manifold trunk such that a second orifice of the second manifold trunk is fluidically interposed between the second trunk inlet of the second manifold trunk and a termination point of the second leg of the second manifold.

15. The system of claim 14, wherein:

the semiconductor processing chamber further includes a third processing station and a fourth processing station,

the first manifold and the second manifolds each have four legs,

the plurality of manifold trunks further includes a third manifold trunk and a fourth manifold trunk,

the third manifold trunk is fluidically connected to a third station inlet of the third processing station,

the fourth manifold trunk is fluidically connected to a fourth station inlet of the fourth processing station,

a third leg of the first manifold is fluidically connected to a first trunk inlet of the third manifold trunk such that a first orifice of the third manifold trunk is fluidically interposed between the first trunk inlet of the third manifold trunk and a termination point of the third leg of the first manifold,

a fourth leg of the first manifold is fluidically connected to a first trunk inlet of the fourth manifold trunk such that a first orifice of the fourth manifold trunk is fluidically interposed between the first trunk inlet of the fourth manifold trunk and a termination point of the fourth leg of the first manifold,

a third leg of the second manifold is fluidically connected to a second trunk inlet of the third manifold trunk such that a second orifice of the third manifold trunk is fluidically interposed between the second trunk inlet of the third manifold trunk and a termination point of the third leg of the second manifold, and

a fourth leg of the second manifold is fluidically connected to a second trunk inlet of the fourth manifold trunk such that a second orifice of the fourth manifold trunk is fluidically

interposed between the second trunk inlet of the fourth manifold trunk and a termination point of the fourth leg of the second manifold.

16. The system of claim 1, further comprising:

a plurality of sensors, wherein each sensor is configured to generate sensor data associated with whether a corresponding valve is open or closed, and

a controller communicatively connected to the plurality of valves and to the plurality of sensors, and comprising at least one memory and at least one processor, the memory stores computer-executable instructions for:

receiving sensor data from the plurality of sensors,

determining, based on the sensor data, whether each of the valves fluidically connected to one manifold is open or closed,

determining, based on the sensor data, whether each of the valves fluidically connected to the other manifolds of the plurality of manifolds is open or closed,

causing, in response to determining that one of valves fluidically connected to the one manifold are closed, that one valve to open, and

causing, in response to determining that one of valves fluidically connected to the other manifolds of the plurality of manifolds are open, that one valve to close.

17. The system of claim 1, further comprising at least one second manifold, wherein:

the second manifold includes a second common input, a multi-leg junction, and a plurality of second legs that are fluidically connected to and extend away from the multi-leg junction such that the multi-leg split is interposed between the second common input and the plurality of second legs,

the multi-leg junction includes a number of splits that matches the number of second legs,

each second leg includes a second delivery line with a second inner diameter,

the second manifold further includes a plurality of second orifices, and

each second orifice:

includes a hole and a body, and the hole has a diameter that is less than 40% of the second inner diameter,

is arranged along a corresponding second leg such that fluid flowing through the second leg flows through a second orifice, and

is positioned at a distance from the multi-leg junction that is less than 20% of the length of the second leg to which the second orifice is connected.

18. The system of claim 17, wherein the second legs are substantially equal in length.
19. A system comprising:
 - a semiconductor processing chamber having a plurality of processing stations, each processing station including a station inlet; and
 - a manifold that includes a common input, a multi-leg junction, a plurality of orifices, and a plurality of legs that are fluidically connected to and extend away from the multi-leg junction such that the multi-leg split is interposed between the common input and the plurality of legs, wherein:
 - the multi-leg junction includes a number of splits that matches the number of legs,
 - each leg is fluidically connected to a corresponding station inlet of the plurality of processing stations, and
 - each orifice:
 - is arranged along a corresponding leg such that fluid flowing through the leg flows through a orifice, and
 - is positioned a distance from the multi-leg junction that is less than 20% of the length of the leg to which the orifice is connected.
20. The system of claim 19, wherein the second legs are substantially equal in length.
21. A manifold trunk for use in a semiconductor processing tool, the manifold trunk comprising:
 - an outlet and an end opposite the outlet;
 - a common flowpath fluidically connected to the outlet;
 - a plurality of trunk inlets fluidically connected to the common flowpath such that fluid flows from each trunk inlet to the outlet via the common flowpath;
 - one or more mounting surfaces;
 - a plurality of orifice plates, wherein each orifice plate:

has an orifice body and a hole in the orifice body, the hole fluidically connected to a corresponding trunk inlet such that each trunk inlet is fluidically interposed between a corresponding orifice and the common flowpath, and

is mounted to one of the mounting surfaces; and
a plurality of valve interfaces, wherein:

each valve interface corresponds to each orifice plate,

when a valve is interfaced at one of the valve interfaces, the valve is capable of regulating fluid flow between the orifice and a manifold leg, and the orifice plate is interposed between the valve and the trunk inlet that corresponds to the orifice plate.

22. The manifold trunk of claim 21, wherein each orifice is swaged into the corresponding orifice plate.
23. The manifold trunk of claim 21, wherein the orifice plate is removably connected to the manifold trunk.
24. The manifold trunk of claim 21, wherein the orifice body comprises ruby.