

TITLE

INTEGRATED BIOCONTAINMENT CELL SORTER

BACKGROUND

[0001] Cell sorter flow cytometers have become an important laboratory tool. Cell sorters are capable of identifying certain types of biological cells and separating those cells from other cells. Commercial uses of cell sorters have also been implemented in several industries. There are many other uses of cell sorters, such as identifying and isolating various types of cells for laboratory applications. As such, cell sorters have many different and varied uses and applications.

SUMMARY

[0002] An embodiment of the present invention may therefore comprise an integrated biocontainment cell sorter flow cytometer comprising: a main cabinet of the integrated biocontainment cell sorter that is not hermetically sealed; an input sample area disposed in the main cabinet; a moveable partition in the main cabinet that moves in an access opening of the main cabinet, the moveable partition covering a constant amount of area of the access opening as the moveable partition is moved in the access opening which leaves a constant amount of area of the access opening that is not covered by the moveable partition, as the moveable partition is moved in the access opening; a first fan that draws air from the main cabinet to create a first low pressure in the main cabinet that is substantially constant as the moveable partition is moved in the access opening, which limits contaminated air in the main cabinet from escaping from the main cabinet; an aerosol management containment area that is not hermetically sealed, which is disposed in the main cabinet, the aerosol management containment area having openings that are connected to the main cabinet so that the aerosol management containment area is disposed in and subject to the first low pressure, the aerosol management containment area having a nozzle that creates a droplet stream containing sample cells, sort plates that separate the droplet stream into deflected stream and collection media, that collect the deflected streams; a second fan that draws air from the aerosol management containment area to create a second low pressure in the aerosol management containment area that is lower than the first low pressure which

causes air from the main cabinet to flow from the main cabinet to the aerosol management containment area and limits contaminated air from flowing from the aerosol management containment area into the main cabinet; optical excitation devices located outside of the main cabinet and the aerosol management containment area to allow access to the optical excitement devices without accessing the main cabinet or the aerosol management containment area.

[0003] Another embodiment of the present invention may therefore comprise a method of containing cells in an integrated biocontainment cell sorter comprising: providing a main cabinet containment area that contains an input area for sample cells to be sorted; moving a moveable partition in an access opening of said main cabinet; generating a first low pressure in the main cabinet using a first fan as said moveable partition is moved in said access opening causing air to be drawn from the main cabinet and from outside the cabinet; generating a second low pressure in an aerosol management containment area, disposed in the main cabinet, using a second fan that draws air from the main cabinet and the aerosol management containment area through openings in the aerosol management containment area to create the second low pressure in the aerosol management containment area that is lower than the first low pressure; enclosing input cell samples in the main cabinet that is not hermetically sealed; enclosing a nozzle, sort plates, collection media and any droplet stream, created by the nozzle, in an aerosol management containment area that is not hermetically sealed; locating optical excitation devices outside of the main cabinet and the aerosol management containment area for easy access for adjustment and maintenance of the optical excitation devices.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Figure 1 is a schematic side cutaway view illustrating various parts of one embodiment of an integrated biocontainment cell sorter.

[0005] Figure 2 is a schematic illustration of the Aerosol Management System (AMS) of Figure 1, including the nozzle chamber and sort chamber and various other parts of an embodiment of an integrated biocontainment cell sorter.

[0006] Figure 3 is a more detailed side cutaway view illustrating the nozzle chamber and the sort chamber of Figure 2.

[0007] Figure 4 is a detailed front view of an embodiment of an integrated

CLAIMS

1. An integrated biocontainment cell sorter flow cytometer comprising:
 - a main cabinet of said integrated biocontainment cell sorter that is not hermetically sealed;
 - an input sample area disposed in said main cabinet;
 - a moveable partition in said main cabinet that moves in an access opening of said main cabinet, said moveable partition covering a constant amount of area of said access opening as said moveable partition is moved in said access opening which leaves a constant amount of area of said access opening that is not covered by said moveable partition, as said moveable partition is moved in said access opening;
 - a first fan that draws air from said main cabinet to create a first low pressure in said main cabinet that is substantially constant as said moveable partition is moved in said access opening, which limits contaminated air in said main cabinet from escaping from said main cabinet;
 - an aerosol management containment area that is not hermetically sealed, which is disposed in said main cabinet, said aerosol management containment area having openings that are connected to said main cabinet so that said aerosol management containment area is disposed in and subject to said first low pressure, said aerosol management containment area having a nozzle that creates a droplet stream containing sample cells, sort plates that separate said droplet stream into deflected stream and collection media, that collect said deflected streams;
 - a second fan that draws air from said aerosol management containment area to create a second low pressure in said aerosol management containment area that is lower than said first low pressure which causes air from said main cabinet to flow from said main cabinet to said aerosol management containment area and limits contaminated air from flowing from said aerosol management containment area into said main cabinet;
 - optical excitation devices located outside of said main cabinet and said aerosol management containment area to allow access to said optical excitement devices without accessing said main cabinet or said aerosol management containment area.

2. The integrated biocontainment cell sorter of claim 1 wherein:
said moveable partition is a slideable window.
3. The integrated biocontainment cell sorter of claim 1 wherein said optical excitation devices comprise lasers and excitation optics.
4. The integrated biocontainment cell sorter of claim 3 wherein detector optics, optical filters, timing and charge circuits and sort logic controllers are located outside of said main cabinet.
5. The integrated biocontainment cell sorter of claim 3 wherein fluidics are located outside of said main cabinet.
6. The integrated biocontainment cell sorter of claim 5 wherein said fluidics comprise sheath fluid controllers and nozzle cleaning devices.
7. The integrated biocontainment sorter of claim 2 further comprising:
a first HEPA filter located adjacent to a main work area of said main cabinet and upstream from said first fan so that said fan circulates clean air and is not contaminated;
a second HEPA filter located adjacent to said aerosol management containment area and upstream from a second fan so that said second fan is not contaminated and removes air from said aerosol management containment area, which is cleaned by said second HEPA filter, and moves clean air to an exhaust vent.
8. A method of containing cells in an integrated biocontainment cell sorter comprising:
providing a main cabinet containment area that contains an input area for sample cells to be sorted;
moving a moveable partition in an access opening of said main cabinet;

generating a first low pressure in said main cabinet using a first fan as said moveable partition is moved in said access opening causing air to be drawn from said main cabinet and from outside said cabinet;

generating a second low pressure in an aerosol management containment area, disposed in said main cabinet, using a second fan that draws air from said main cabinet and said aerosol management containment area through openings in said aerosol management containment area to create said second low pressure in said aerosol management containment area that is lower than said first low pressure;

enclosing input cell samples in said main cabinet that is not hermetically sealed;

enclosing a nozzle, sort plates, collection media and any droplet stream, created by said nozzle, in an aerosol management containment area that is not hermetically sealed;

locating optical excitation devices outside of said main cabinet and said aerosol management containment area for easy access for adjustment and maintenance of said optical excitation devices.

9. The method of claim 8 wherein said method of locating optical excitation devices outside of said main cabinet comprises locating lasers and laser optics outside of said main cabinet.

10. The method of claim 8 further comprising:

locating detector optics, optical filters, timing and charge circuits, acquisition electronics and sort logic controllers outside of said main cabinet.

11. The method of claim 8 further comprising:

locating fluidics outside of said main cabinet.

12. The method of claim 11 wherein said method of locating said fluidics outside of said main cabinet comprises:

locating sheath fluid controllers and nozzle cleaning devices outside of said

main cabinet.

13. The method of claim 8 further comprising:

using said moveable partition in said access opening of said main cabinet that covers an area of said access opening so that a constant amount of area of said access opening is not covered by said moveable partition which remains constant as said moveable partition is moved in said access opening, which causes said first low pressure to remain constant as said moveable partition is moved in said access opening.

14. The method of claim 13 wherein said moveable partition is transparent and moves to allow access to lower portions of said main cabinet when said moveable partition is in an upper position, and moves to allow access to upper portions of said main cabinet when said moveable partition is in a lower position.

15. The method of containing cells of claim 8 further comprising:

filtering said outside air and said air from said main cabinet upstream from said first fan so that said first fan is not contaminated and air under pressure from said first fan is clean air that can be circulated in said integrated biocontainment cell sorter without contamination.

16. The method of containing cells of claim 8 further comprising:

filtering air drawn from said aerosol management containment area upstream from said second fan so that said second fan is not contaminated and clean air under pressure from said second fan is transmitted through said integrated biocontainment cell sorter and exhausted without contamination.