**Today, we will**:

- Continue discussing filter and face mask classification, and discuss **pleated air filters**
- Discuss **baghouses** and various ways to remove dust cakes from the bags
- Briefly discuss **electrostatic precipitators** (**ESP**s)

**Face mask classification:**

**N95, N99, and N100 Face Masks**:

N95 N99 N100

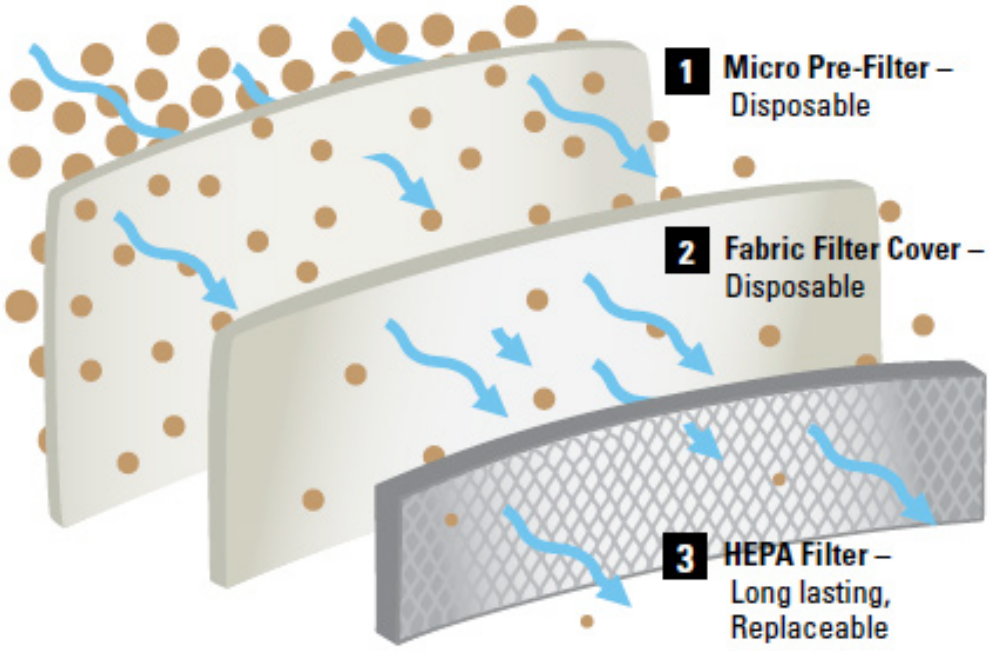

United States NIOSH standards define the following categories of particulate filters (from http://en.wikipedia.org/wiki/Respirator ):

| Oil resistance | Rating | Description |
|---|---|---|
| Not oil resistant | N95 | Filters at least 95% of airborne particles |
| | N99 | Filters at least 99% of airborne particles |
| | N100 | Filters at least 99.97% of airborne particles |
| Oil Resistant | R95 | Filters at least 95% of airborne particles |
| | R99 | Filters at least 99% of airborne particles |
| | R100 | Filters at least 99.97% of airborne particles |
| Oil Proof | P95 | Filters at least 95% of airborne particles |
| | P99 | Filters at least 99% of airborne particles |
| | P100 | Filters at least 99.97% of airborne particles |

These measurements of removal efficiency are typically for particles in the "dip", usually particles with $0.1 < D_p < 0.3$ μm. However, some studies us a different range to cover the entire "dip", namely $0.04 < D_p < 1.3$ μm.

Example of a pleated filter: (from http://www.onlinevacshop.com/Fantom-HEPA-Filter.php)

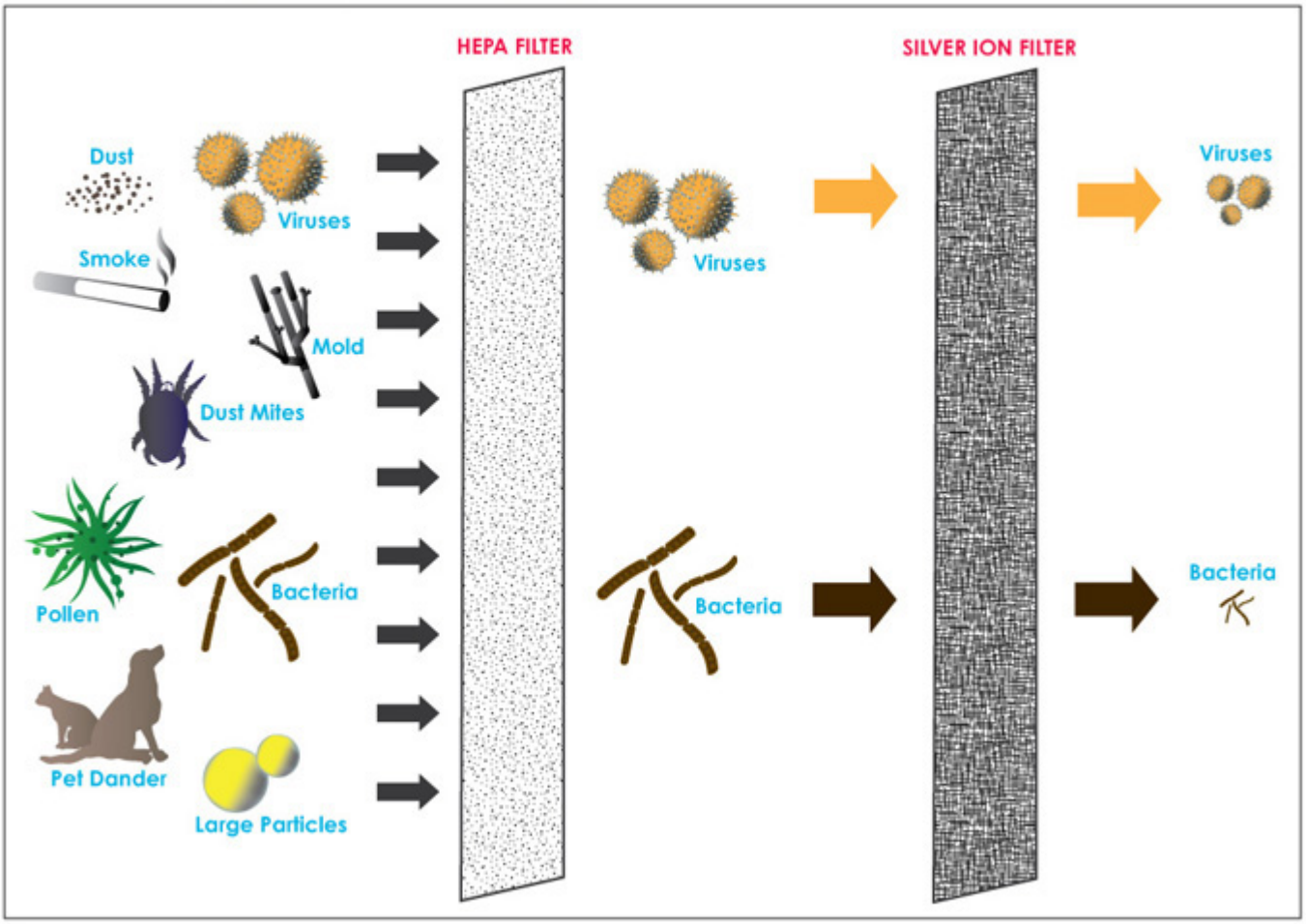

Some images from filter manufacturers:
From http://certifiedhepafilter.com/ :



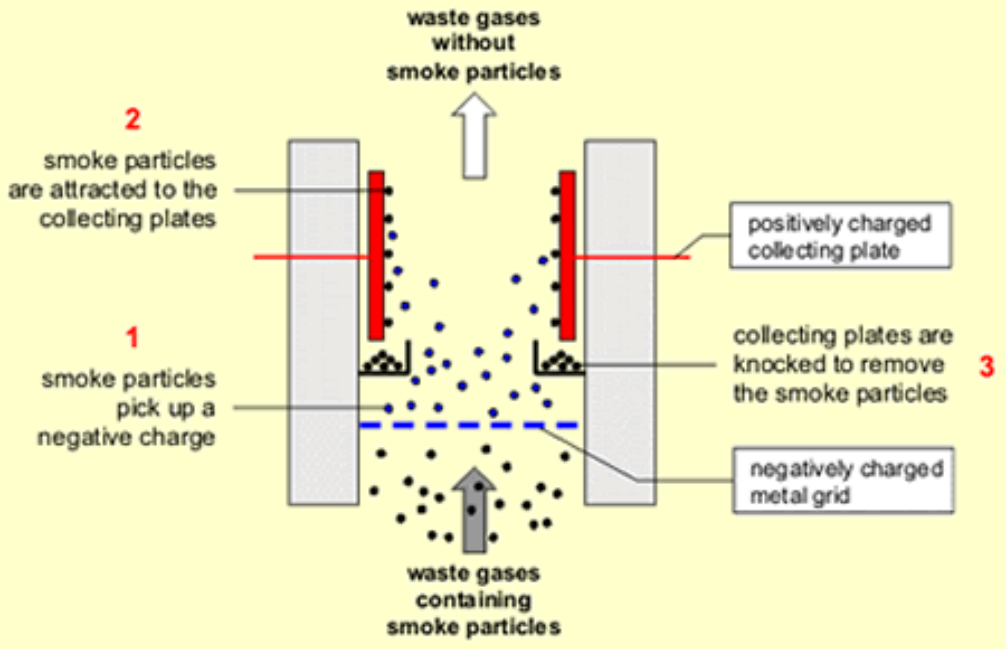
From http://www.cleancraft.com/Alen_A350_Replacement_Silver_HEPA_Air_Filter_p/ap-aa350f-silv.htm :

## HEPA with Silver Ion Filtration

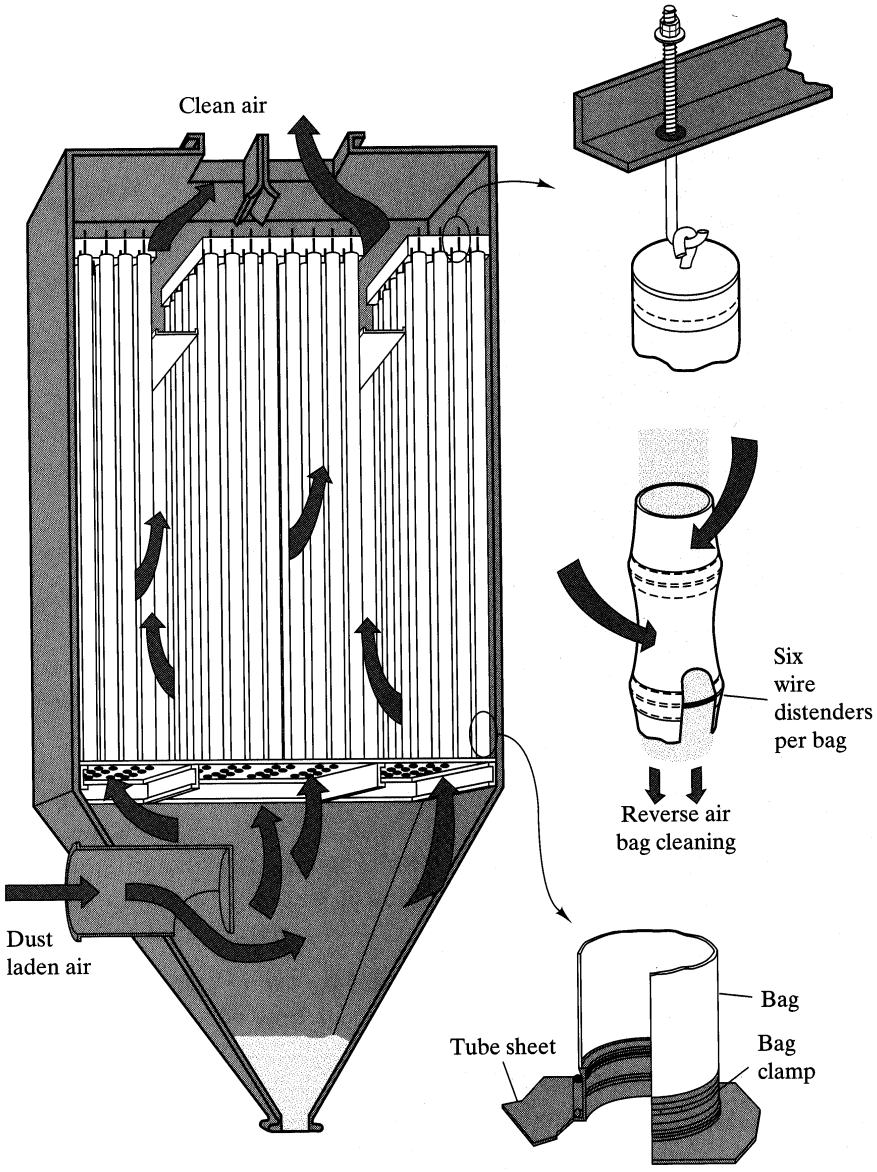
**The HEPA filter eliminates over 99% of airborne allergens while the addition of the Silver Ion filter eliminates 98% of bacteria and half of airborne viruses.**



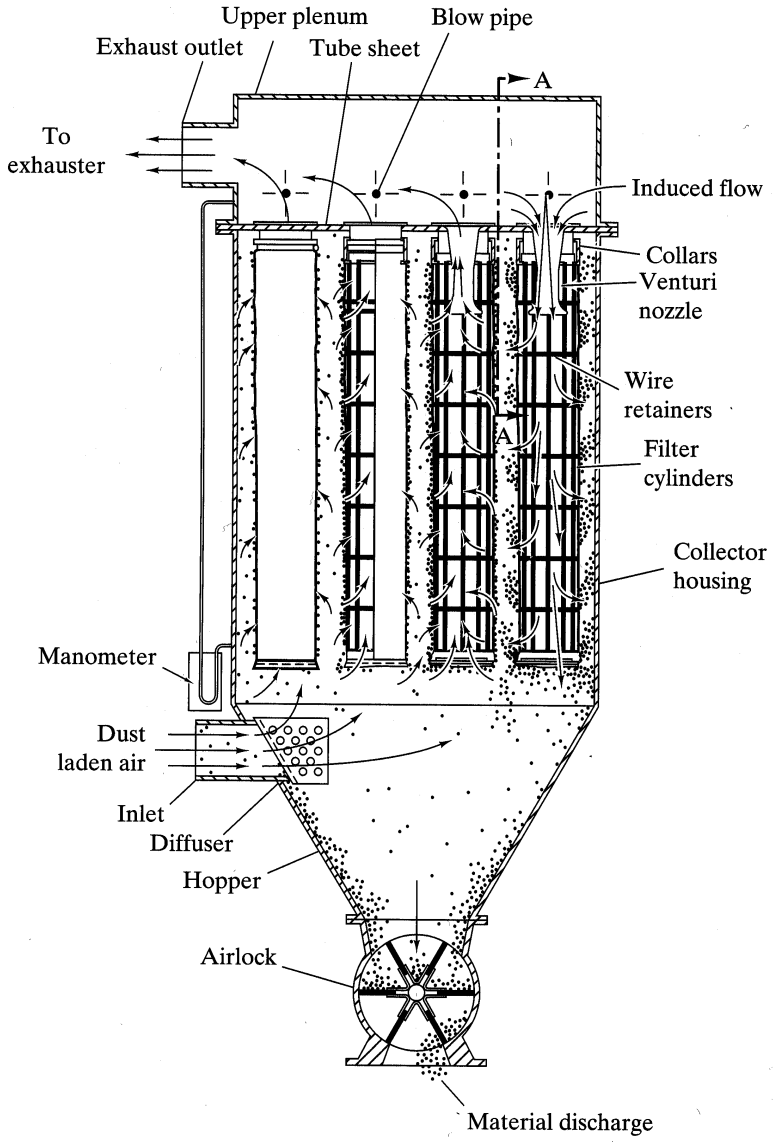
Ionizer. From http://air-purifier-reviewsite.com/blog/types-of-air-purifier-technology-that-is-best-for-allergies/ :



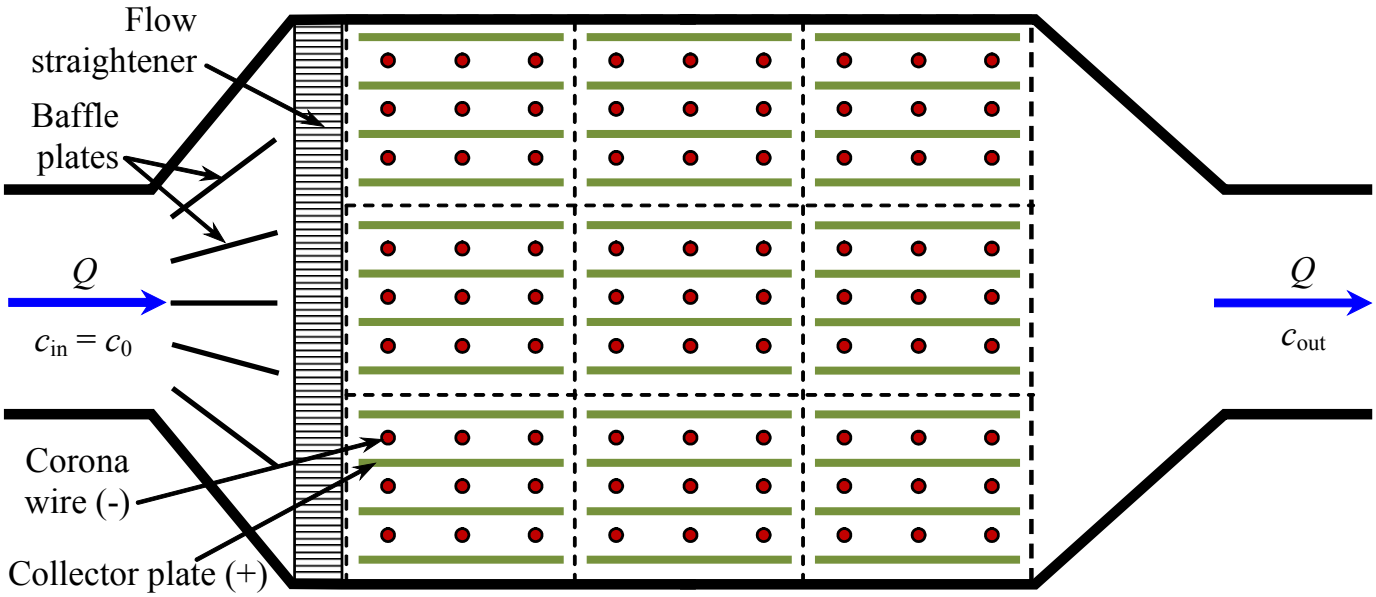
Reverse-flow baghouse:



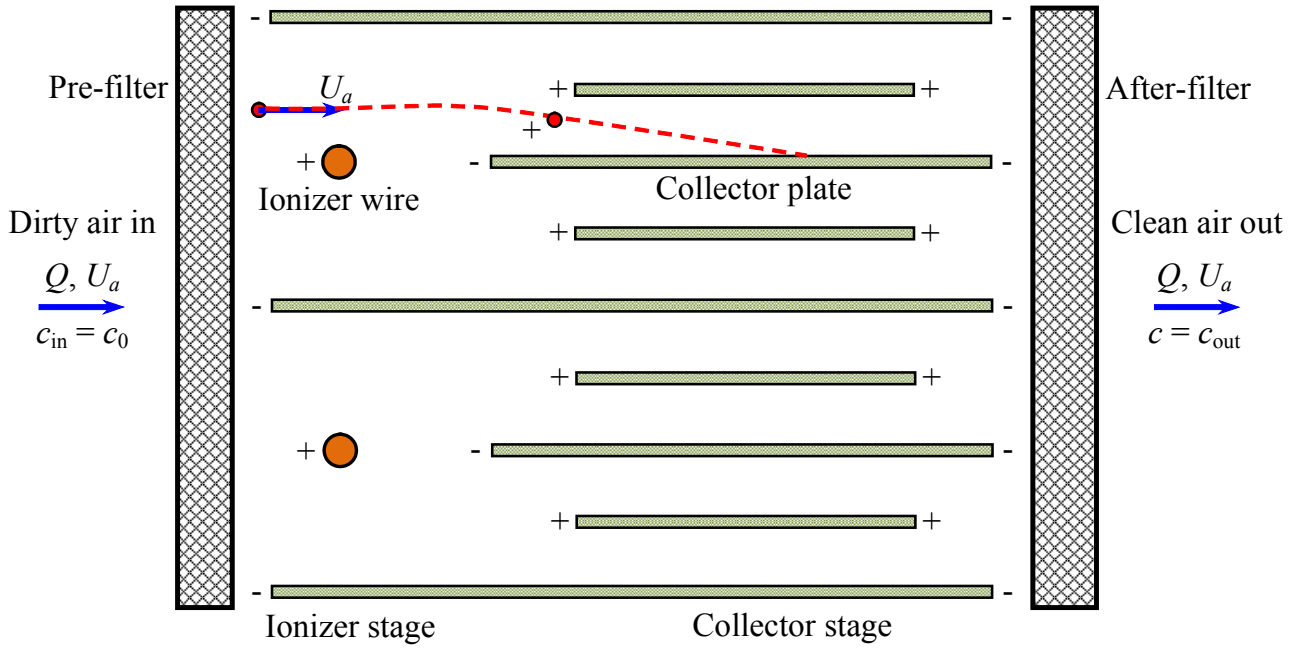
# Pulse-jet baghouse:



## Electrostatic Precipitators (ESPs):

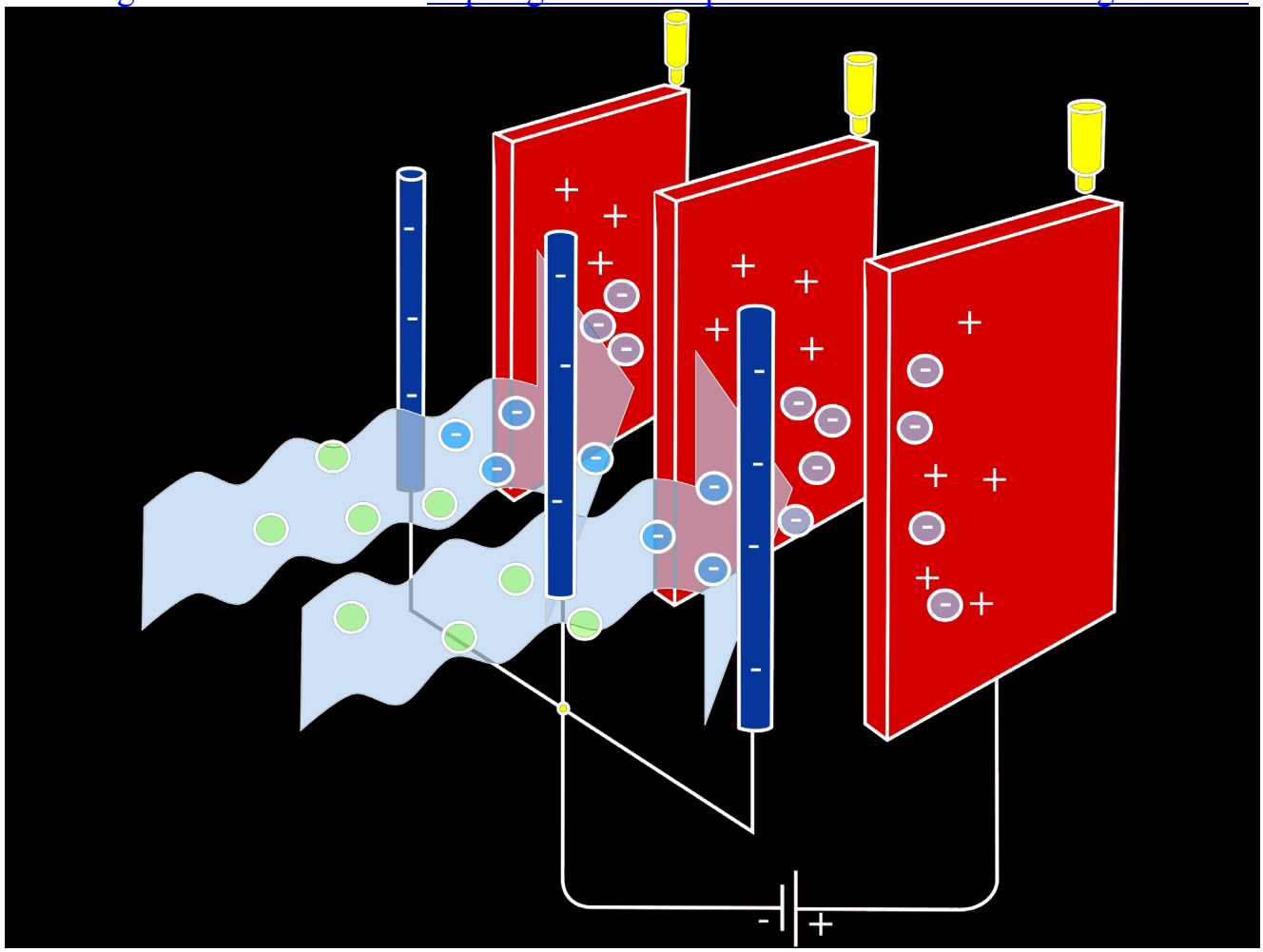



Top view of a negative ionization, single-stage, plate-wire ESP, with three parallel legs, each of which has three modules in series; circles represent the negatively charged corona wires, lines represent the positively charged collector plates. From Heinsohn and Cimbala (2003).

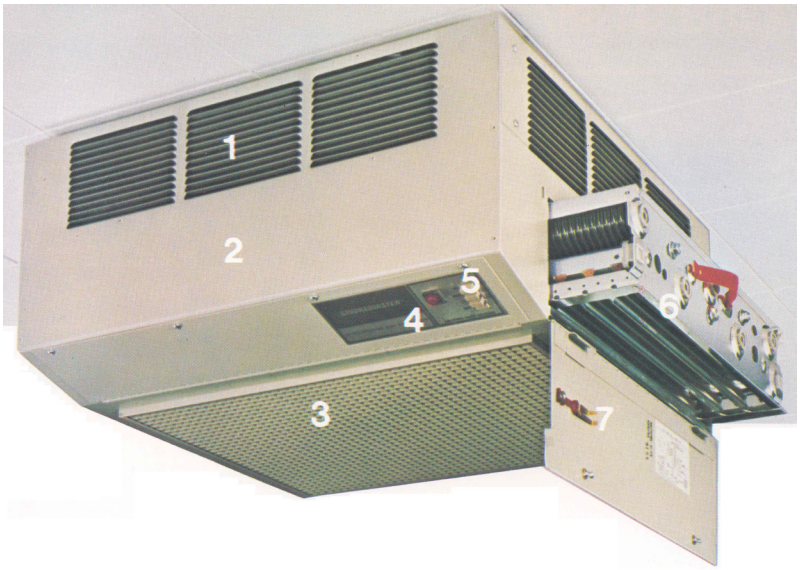



Schematic diagram of a positive ionization, two-stage, plate-wire ESP; dashed line indicates a particle trajectory. From Heinsohn and Cimbala (2003).

Nice diagram of an ESP from https://gsf165.wordpress.com/2013/04/13/flue-gas-filters/ :



Ceiling mounted ESP for restaurants and other public places:




Smokemaster ceiling-mounted two-stage electrostatic precipitator that removes smoke, fume and small particles from public places; 1 – discharge louvers, 2 – housing, 3 – prefilters and grille, 4 – indicator lamp, 5 – speed control, 6 – ESP cells, 7 – access door. From Heinsohn and Cimbala (2003).