

ionizing field, and some 6000 volts between the plates upon which the precipitation of dust occurs. These voltages, which are capable of momentary shock to personnel similar to that of a spark plug, necessitate some safety measures. A typical arrangement provides means for making the equipment inoperative when any door affording access to high voltage parts is opened. Operation can be resumed only after all doors are closed. The voltages necessary for operation of the equipment are usually obtained by means of electronic high voltage direct current power packs operating from a 110-120 volt, 60 cycle, single phase building service. Electric power consumption is about 10 watts per 1000 cfm, plus the approximately 40 watts required to energize the rectifier tube heaters.

Air cleaners of this type offer negligible resistance to air flow and, therefore, care must be exercised in arranging the duct approaches on the entering and leaving sides of the cleaners in order that the air flow may be

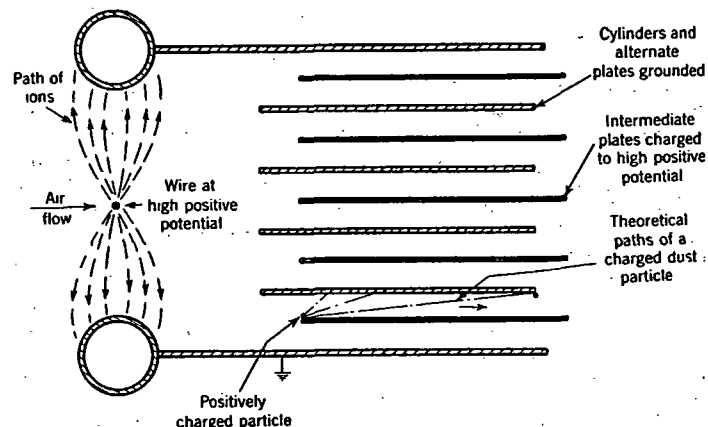


FIG. 1. DIAGRAMMATIC CROSS-SECTION OF IONIZING TYPE ELECTRONIC AIR CLEANER

distributed uniformly over the cross-sectional area. The efficiency of the electronic air cleaner is sensitive to air velocity, and the device itself has much less tendency to rectify the air stream than filters which have higher resistances. In most systems, resistance is deliberately added in the form of a perforated plate, pre-filters or after-filters for the purpose of obtaining a uniform distribution of air. The resistance, including the baffles or after-filters, is constant and generally ranges from 0.15 to 0.25 in. of water at the usual velocities of 300 to 400 fpm. Such plates or filters, however, cannot compensate for defects in the duct layout ahead of the cleaner. Suitable screens of no coarser than 16 mesh should be installed across all outside air entrances to prevent insects, leaves, bits of paper and similar material from entering the cleaner. Where lint is present in appreciable quantities, devices for lint removal should be installed ahead of the cleaner.

Electronic air cleaners of the ionizing type are efficient, low pressure drop devices for removing fine dust and smoke particles. They are available in fixed collector-plate and moving collector-plate types. The fixed collector plates are often coated with a special oil as an adhesive. Cleaning

is generally accomplished by washing the cells in place with hot water from a water hose or by means of fixed or moving nozzle systems. The bottom of the equipment is made water tight and provided with a drain. In one moving-plate type, the grounded elements on which the dirt collects are mounted on chains, and are alternately dipped in oil and exposed to the air stream.

Charged Media Electronic Air Cleaners

The charged media type air cleaner consists of a dielectric filtering medium, usually arranged in pleats as in typical dry filters. No ionization means are employed. The dielectric filtering medium may consist of glass fiber mat, cellulose mat or other similar material, and is supported on or in contact with a gridwork consisting of alternately grounded and charged members, the latter usually being held at a potential of 12,000 volts d.c. An intense and non-uniform electrostatic field is thus created through the

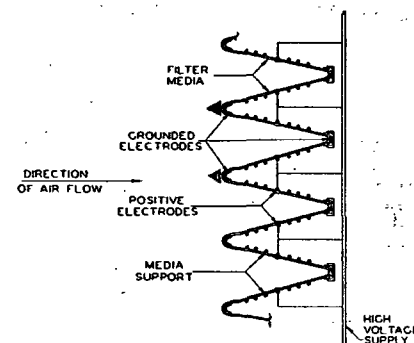


FIG. 2. CROSS-SECTION DIAGRAM OF CHARGED MEDIA TYPE ELECTRONIC AIR CLEANER

dielectric medium. Airborne particles approaching the field are polarized and drawn toward filaments or fibers of the media. The general arrangement illustrating this type of filter is shown in Fig. 2.

The precipitator of this type offers resistance to air flow, when clean, on the order of 0.10 in. of water at 250 fpm velocity and, unlike the ionizing type, the resistance of the charged media type electronic cleaner rises as dust is accumulated on the media. Because of these characteristics the filter tends to equalize the air distribution over the face of the filter. Like typical replaceable media mechanical filters, the charged media precipitator is serviced by replacing the filtering medium. The dielectric properties of the media are impaired when the relative humidity exceeds 70 percent.

AIR CLEANER PERFORMANCE AND TESTING

Atmospheric air cleaners are generally rated in terms of the three more critical factors in performance; namely, (1) resistance vs air flow, (2) efficiency or arrestance vs dust load at design air flow, and, (3) resistance vs dust load at design air flow.

Air flow is expressed in cubic feet per minute and is therefore a function of face velocity and filter size. Face velocity is defined as the average