clogging dirt mat on the filter face. High velocity filters are apt to be adversely affected if the amount of lint in the air to be cleaned is excessive.

The resistance of filters increases with dust or lint loading, and it is the resistance due to this cause which ordinarily necessitates servicing. The rate of loading obviously depends upon the amount as well as the kind of dust in the air, and for this reason, periods between servicing cannot be predicted. Manometers are often installed to indicate the pressure drop across filter banks, and they serve to indicate when the filter requires cleaning. The pressure drop tolerated differs between operators and system designs. The resistance of a filter bank can be kept desirably low by periodically servicing some, but not all, of the units in the bank at one time. It is to be noted that a decline in efficiency may be the limiting factor in filter life rather than increased resistance due to load.

The method of cleaning viscous impingement unit filters differs for different types of filters and kinds of dust. Much dry dust or lint can often be removed by rapping the filter.

Throw-away filters are constructed of inexpensive materials, and are designed to be discarded after one use. The frame is frequently a combination of cardboard and wire.

Cleanable filters usually have metal frames. Various cleaning methods have been recommended including: air jet, water jet, steam jet, washing in kerosene, and dipping in an oil. The latter may serve both to clean the filter and add the necessary adhesive.

It is not mandatory that unit filters be removed from their metal frames for cleaning outside of the system. Cleaning of unit filters in place is feasible by means of hot water sprayed from a hose or by means of fixed nozzles to accomplish washing and adhesive application. Where filters are cleaned in place, provision should be made to collect and drain the water so as to prevent leakage from the filter housing.

Automatic Viscous Filters

In an automatic air filter, means are provided to remove the dust from the medium mechanically. Automatic filters with moving cloth media have been constructed, but are not now in wide use.

The medium in a typical automatic filter at present consists of a series of specially formed metal plates mounted on a pair of chains. The chains are mounted on sprockets located at the top and bottom of the filter housing, so that the filter medium can be moved as a continuous curtain up one side and down the other side of the sprockets. The arrangement is such that, at the bottom, the medium passes through a bath of special oil which both serves to remove the dirt from the plates, and acts as an adhesive when the cleaned plates next pass through the air stream. The plates forming the filtering medium or curtain usually overlap each other, and due to their special shape, many small air passages are formed between them. These air passages turn abruptly one or more times in order to give the impingement effect.

An electrically driven rotating device is usually supplied with an automatic filter. The device may be set to move the curtain periodically, or a special switch, actuated by pressure drop, may be used to govern its motion. In operation, the resistance of an automatic filter will remain approximately constant as long as proper operation is obtained. A resistance of ½ in. water at a face velocity of 500 fpm is typical of this class.

DRY AIR FILTERS

The media in such filters are usually fabrics or fabric-like materials. Media of wool felt, cotton batting (both glazed and unglazed), cellulose fiber and other materials have been used commercially. The medium in a filter of this class is usually supported by a wire frame in the form of pockets or V-shaped pleats in order to increase the area exposed to the passage of air. A 2-ft square unit may contain from 15 to 30 sq ft of medium.

Dry air filters, by virtue of the large area of medium used, have a comparatively high lint holding capacity. The efficiency of dry type filters is usually higher than that of viscous impingement filters, while the life of the former based on dust holding capacity, may be lower. Dust tends to clog the fine pores or openings of dry filters more quickly, thereby causing a higher rate of resistance rise than for viscous impingement filters. Effi-

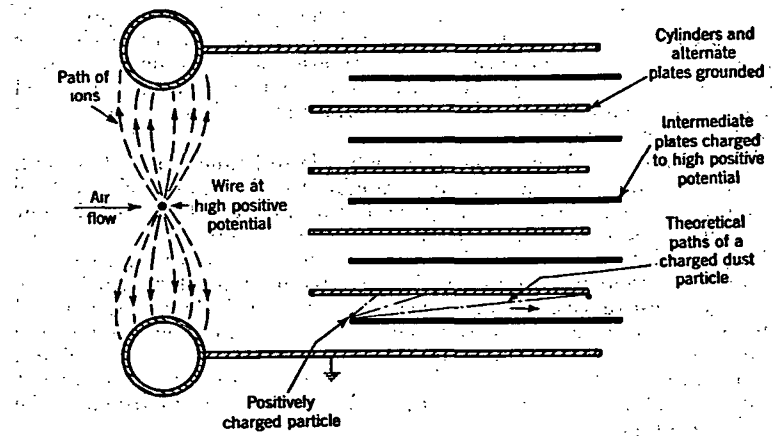

FIG. 1. DIAGRAMMATIC CROSS-SECTION OF IONIZING TYPE ELECTROSTATIC PRECIPITATOR

ciency with very fine particles equivalent to that of electrostatic precipitation is not uncommon with certain types of dry filters. A comparatively deep bed, ½ to 1 in. thickness, of filtering media having individual fibers in the order of 1 micron in diameter, is required for such high efficiency.

Dry filters may consist of a cleanable medium held in permanent frames, or a throw-away or replaceable filtering medium held in permanent frames, or the entire filter may be of the throw-away type. Usually the filtering medium alone is replaced after having collected its full dust load.

ELECTRIC PRECIPITATORS

Two principal types of electrostatic precipitators are available for air filter application: (1) ionizing type collectors where particles are given a definite charge by passing through an ionization zone, and (2) charged media type collectors where the energized, collecting medium induces a charge on the particles.

Ionizing Type Electrostatic Precipitator

The fact that a particle exposed to an electric field will assume a charge and migrate toward one of the electrodes, has been utilized for some years