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ELECTRICAL PRECIPITATORS

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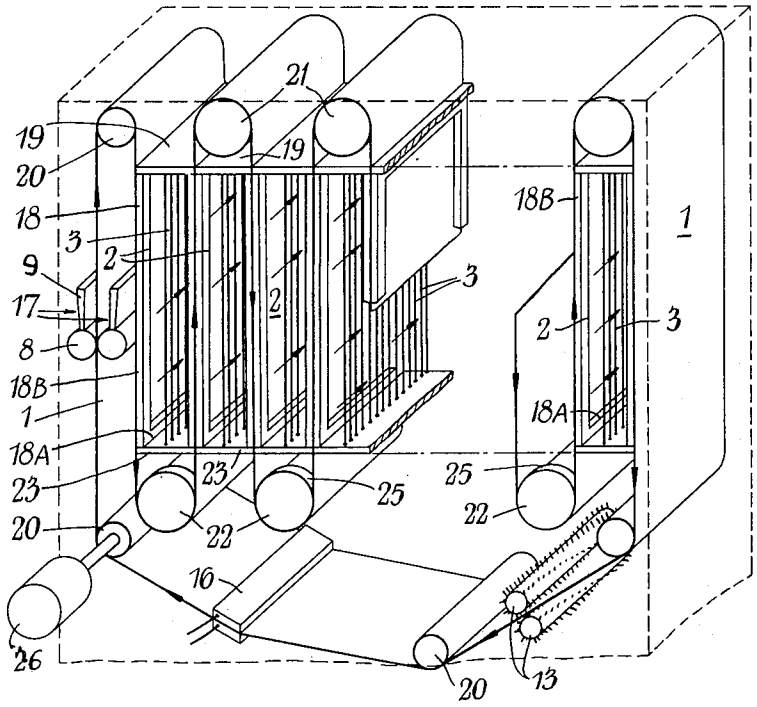


FIG. 1

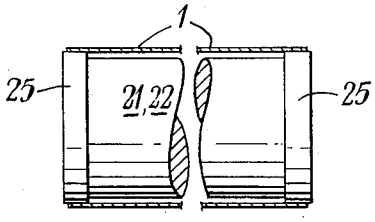


FIG. 2

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ELECTRICAL PRECIPITATORS

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This invention relates to an electrostatic precipitator, i.e. a device for removing solid or liquid particles from air or other gases.

It has already been proposed to provide electrostatic precipitators so constructed as to make it possible for the collector electrodes (otherwise known as separating electrodes) to be cleaned during operation of the precipitators. Generally concerned here are plate-like electrodes made of wire gauze, which are suspended from displacement devices and are so moved that they dip at their lowest point of movement into a vessel containing a cleaning liquid. The deposited particles adhering to the gauze are flushed off by the latter being drawn through the cleaning liquid. This apparatus has the defect that the degree of deposition on wire gauze electrodes is relatively low and, after cleaning the electrodes, which generally can only be incomplete, the particles do not readily adhere to the electrodes.

According to the present invention there is provided an electrostatic precipitator comprising an earthed separator electrode in the form of an impermeable and endless band of which part is of sinuous formation with vertical portions parallel to one another and extending in opposite directions succeeding one another along the length of the band, a lower set of supporting devices around which the band passes at the lower ends of said portions, an upper set of supporting devices around which the band passes at the upper ends of said portions, further supporting devices for supporting the remainder of the band so that the band follows a defined endless path, means for turning at least one of the supporting devices so that the band will be caused to move around said path, upper and lower partitions situated between adjacent ones of said portions and forming with said portions a plurality of separating chambers which are substantially closed at top and bottom by said partitions and are separated by them from said supporting devices and which are each closed at two opposite sides by said portions and open at the other two opposite sides for the throughflow of gas to be cleaned, a cleaning device disposed adjacent said path for removing from said remainder of the band particles deposited thereon, means for causing a gas to be cleaned to flow horizontally through said chambers by way of said other two opposite sides, and means for ionising the gas which flows as aforesaid and for producing a strong electric field within the chambers.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying diagrammatic drawings in which:

FIGURES 1 and 2 are respectively a perspective view and a fragmentary end view of part of an electrostatic precipitator.

In the precipitator shown in FIGURES 1 and 2, an impermeable and endless metallic band **1** serves as separator electrode and is for that purpose grounded and is so guided over supporting devices, in the form of a lower set of rollers **22**, an upper set of rollers **21** and further rollers **20** of smaller diameter, that the band follows a defined endless path, most of which is sinuous. Between each two adjacent vertical stretches of the band there is an upper partition **19** and a lower partition **23**. Each partition is in

the form of a rectangular horizontal plate the longer edges of which come very close to the band. Thus, between each two adjacent vertical stretches of the band there is formed a chamber **2**, hereinafter called a separating chamber, which is substantially closed at top and bottom by the partitions **19** and **23** and is closed at two opposite sides by the band itself and is open at the other two opposite sides for the throughflow of air or other gas to be cleaned. Stretched across each separating chamber between the corresponding upper and lower partitions are a number of ionising electrodes in the form of vertical discharge wires **3** to which a high direct voltage is applied. The ionisation of the air or gas molecules is effected by a corona discharge around the electrodes **3**. The ions which are formed are then deposited on the solid or liquid particles in the air stream and the charged particles are deposited on the surface of the band **1** due to the potential difference existing between the electrodes **3** and the band **1**. The band **1** is electrically earthed, so that no danger exists in operating the electrostatic filter constructed in this way.

In each separating chamber **2** there are two rectangular frames **18**, one touching the band **1** on one side of the chamber and the other touching it on the other side. The horizontal sides **18A** of the frame are fixed to the partitions **19** and **23** and the vertical sides **18B** prevent deposition of the particles from the gas on the marginal portions of the band **1**. It is arranged that only these marginal portions of the band bear upon the rollers **21** and **22**. This effect is obtained as shown in FIGURE 2 by the end portions **25** of the guide rollers being formed as thickened collars.

After any point on the band **1** has travelled over all the rollers **20** through **22**, i.e. through all the chambers **2**, it passes through a cleaning bath (not shown), which contains, in addition to the cleaning liquid, two brush devices **13** by which solid or liquid particles adhering to the band are removed. The cleaning bath has a supply pipe and a discharge pipe (not shown) so that it is possible constantly to renew the cleaning liquid and the deposited slugde of particles can be discharged through the discharge pipe. After the wet band has left the cleaning plant, the band **1** travels through a drying device **16** and then passes in a dried condition to two devices **17** by which an adhesive material is applied to the band. In the illustrated case, each such device has a roller **8** which is provided with a soft absorbent surface and onto which adhesive oil is dropped from a holder **9**. The result is obtained that the band **1** is coated with a film of adhesive oil on both sides thereof and the particles will thus adhere more readily to the band as it travels through the chambers **2**. The width and position of the oil-supply roller **8** is such that the side margins of the band running on the collars at the ends **25** of the rollers **21** and **22** are not wetted with oil, so that no adhesion occurs between the band and the collars and also only a few particles are deposited on the edges of the band. The side walls **11** of the precipitator are made of electrically insulating material so that no deposition can occur thereon. The driving of the band system takes place through one or more of the rollers **20** through **22** by means of a motor diagrammatically shown at **26** which is adjustable as regards speed, the drive being effected by friction or by having a band which is perforated at the margins in the manner of a roll film. In this case, the driven roller or rollers must carry sprocket teeth.

The partitions **19** and **23** serve to guide the gas to be cleaned through the spaces between the vertical stretches of the band **1** and they also prevent particles being deposited on the rollers **21** and **22**, whereas the frames **18** fixed to the partitions serve, by their vertical sides **18B**,

to prevent particles being deposited on the marginal portions of the band.

I claim:

1. An electrostatic precipitator comprising an earthed separator electrode in the form of an endless band of electrically conductive material of which part is of sinuous formation with vertical portions, which are substantially impermeable and flat and are parallel to one another and extend in opposite directions and in which the edges of the band are also vertical, succeeding one another along the length of the band, a lower set of supporting devices around which the band passes at the lower ends of said portions, an upper set of supporting devices around which the band passes at the upper ends of said portions, further supporting devices for supporting the remainder of the band so that the band follows a defined endless path, means for turning at least one of the supporting devices so that the band will be caused to move around said path, upper and lower partitions situated between adjacent ones of said portions and forming with said portions a plurality of separating chambers which are substantially closed at top and bottom by said partitions and are separated by them from said supporting devices and which are each substantially closed at two opposite sides by said portions and open at the other two opposite sides for the throughflow of gas to be cleaned, a cleaning device disposed adjacent said path for removing from said remainder of the band particles deposited thereon, means for causing a gas to be cleaned to flow horizontally through said chambers by way of said other two opposite sides, and means for ionising the gas which flows as aforesaid and for producing a strong electric field within the chambers.

2. A precipitator according to claim 1, wherein the ionising and electric field producing means include a counter electrode made of wire situated in each separating chamber and means for applying a high potential to said counter electrode.

3. A precipitator according to claim 1 and further comprising tensioned wire electrodes, constituting part of said ionising means, stretched across each separating chamber from the upper partition to the lower partition.

4. A precipitator according to claim 1 and further comprising at a location adjacent said path, in advance of said sinuous part having regard to the direction of movement of the band, a device for applying to the band a substance which will cause the particles to adhere more readily to the band.

5. A precipitator according to claim 4 and in which the cleaning device is one which wets the band, there being provided a drying device which dries the band after it leaves the cleaning device and before it reaches said location.

6. An electrostatic precipitator comprising an earthed separator electrode in the form of an endless band of which part is of sinuous formation with vertical portions, which are substantially impermeable and flat and are parallel to one another and extend in opposite directions, succeeding one another along the length of the band, an upper set of supporting and guide rollers which are arranged with their axes horizontal and which have the band passing around them at the upper ends of said portions, a lower set of supporting and guide rollers which are arranged with their axes horizontal and which have the band passing around them at the lower ends of said portions, the longitudinal marginal portions only of said band engaging the rollers, upper partitions and lower partitions situated between adjacent ones of said portions and forming between each two of the latter a separating chamber, which chambers are separated from said rollers by said partitions and are substantially closed at top and bottom by said partitions and on two opposite sides by said portions and which are open at the other two sides for the throughflow of gas to be cleaned, means for causing a gas to be cleaned to flow substantially horizontally through each separating chamber by way of said other two opposite sides, wire ioniser electrodes extending across the chambers from the upper partitions to the lower partitions and lying in planes parallel to those of said portions of the band, supporting devices for supporting the remainder of the band so that the band follows a defined endless path, means co-operating with the band for advancing the band so that the band will be caused to move around said path, and a cleaning device disposed adjacent said path for removing from said remainder of the band particles deposited thereon.

7. An electrostatic precipitator comprising an earthed separator electrode in the form of an endless band of which part is of sinuous formation with vertical portions, which are substantially impermeable and flat and are parallel to one another and extend in opposite directions, succeeding one another along the length of the band, a lower set of supporting devices around which the band passes at the lower ends of said portions, an upper set of supporting devices around which the band passes at the upper ends of said portions, the upper and lower supporting devices each being constituted by a roller which engages only the marginal portions of the band, further supporting devices for supporting the remainder of the band so that the band follows a defined endless path, means for turning at least one of the supporting devices so that the band will be caused to move around said path, upper and lower partitions situated between each two adjacent ones of said portions and forming with said portions a plurality of separating chambers, one between each two adjacent vertical portions of the band, which chambers are substantially closed at top and bottom by said partitions and are separated by them from said supporting devices and are each substantially closed at two opposite sides by said portions and open at the other two opposite sides for the throughflow of gas to be cleaned, a cleaning device disposed adjacent said path for removing from said remainder of the band particles deposited thereon, means for causing a gas to be cleaned to flow horizontally through said chambers by way of said other two opposite sides, and means for ionising the gas which flows as aforesaid and for producing a strong electric field within the chambers.

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