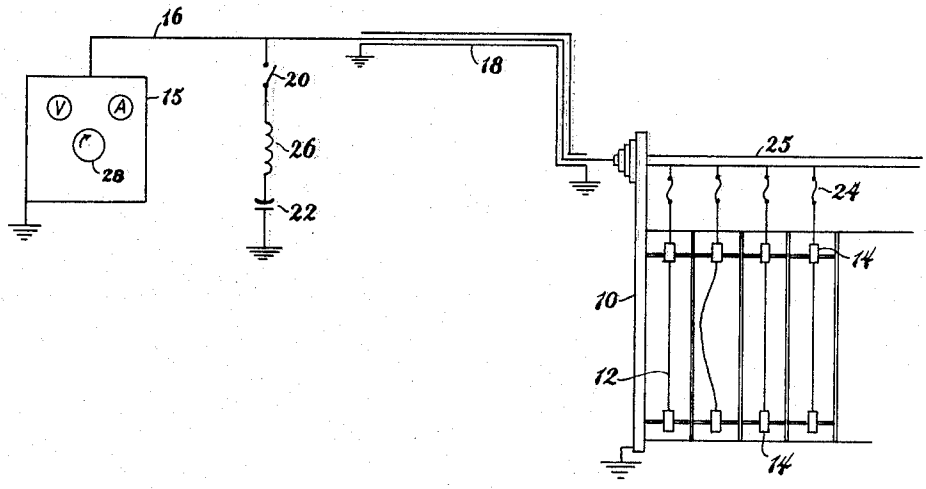
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MEANS FOR CLEARING SHORT CIRCUITS IN ELECTRICAL PRECIPITATORS

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MEANS FOR CLEARING SHORT CIRCUITS IN ELECTRICAL PRECIPITATORS

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The present invention relates to precipitators that remove dust and other particulate matter from gases, and it is primarily concerned with a novel means that selectively clears short circuits or faults occurring between high voltage electrodes and grounded collecting surfaces without necessitating a complete shut-down of the apparatus.

The precipitator in which this invention is embodied effects removal of particulate matter from a continuously flowing column of impure gases by electrostatic means. A precipitator of this type may comprise a plurality of sections, each section being connected to an individual power supply and each section comprising a multitude of grounded collecting elements or tubes in combination with discharge electrodes connected to a high voltage source adapted to ionize a stream of impure gases flowing through the electrode arrangement such that the particulate matter carried by the gases is collected on the grounded tubes.

During operation of such apparatus, the ionizing electrodes or their supporting insulators may develop defects that cause short circuits or flashovers, before operating voltages are reached to the effect that the collecting efficiency of the entire bank of electrodes with which they are associated is substantially reduced.

The present invention contemplates the provision for apparatus of the kind described in which one or a number of short circuited electrodes in an electrostatic precipitator may be electrically separated from the system without affecting the operation of the system or necessitating a shut-down of the boiler for purposes of repair.

The invention may be described generally as the application of a power feed to a number of fused electrodes in combination with fuse evaporating means that in case of a fault in any electrode may effectively isolate the faulty electrode from the rest of the system.

The invention will be best understood upon consideration of the following detailed description of an illustrative embodiment thereof when read in conjunction with the accompanying drawings in which:

The drawing is a schematic view of a gas cleaning system to which is connected a power source for fuse evaporation that successfully evaporates fuses in series with electrodes that arc over at a voltage level below that at which they would normally evaporate.

The drawing illustrates a section of an electrostatic precipitator including a bank of grounded collecting electrodes or tubes **10** having a discharge electrodes **12** supported by insulators **14**. The electrodes are connected to a power supply **15** by a cable **16** having a grounded sheath **18**. The high voltage output lead of the power supply is connected to the cable leading to the bank of collecting tubes. Fuses **24** connect the high voltage lead **25** to each electrode or group of electrodes as desired to provide means to disconnect electrically from the power supply any electrode that has developed a ground connection or which flashes over to ground before reaching sufficiently high voltage as required for normal ionization.

To this precipitating equipment there is temporarily connected as by a switch **20**, for the purpose of blowing a fuse, a capacitor **22** which is grounded at one end and

connected to an inductance **26** which leads to the high voltage supply at the other end.

An apparatus of this type is designed to evaporate the particular fuse which leads to an electrode which arcs over at a voltage below normal operating voltage. The occurrence of such arc-overs below normal operating voltage in a precipitator indicates the presence of a faulty electrode. To disconnect this faulty electrode, the fuse blowing apparatus **22** and **26** is connected to the power lead **16** feeding the faulty section by closing switch **20** and the output voltage of the power supply **15** is gradually raised until abnormal breakdown voltage in the precipitator is reached by actuating the manual voltage control at **28**. At the moment the arc-over occurs between the faulty electrode and ground, the energy stored in the capacitor **22** discharges through the arc-over path and on the way to it, evaporates or blows the fuse. With the fuse evaporated the faulty electrode is disconnected, switch **20** is opened, and normal operation restored to the rest of the precipitator.

The energy stored in the capacitor battery must be large enough to evaporate the fuse upon discharge. The fuse on the other hand must be solid enough to stand all current that flows to the fused electrode or group of electrodes during normal operation. Good results are obtained using a capacity of 20 microfarads with faulty electrodes arcing over above 6 kv. The discharge of the stored energy is slowed down by means of the inductance **26** which is of the order of 100 millihenries, in order to avoid damage to circuit elements.

Stainless steel wire has been used successfully for fuses which are designed to burn out at sustained current loads of about 10 amperes. The ordinary operating current passing a fuse leading to, for instance, 10 electrodes is between 10 and 20 milliamperes, and in case of individually fused electrodes it is between 1 and 2 milliamperes. The current peak during operational flashovers in the precipitator is limited to from 2 to 5 amperes by the design of the power supply. This leaves the fuse unaffected during ordinary operation of the precipitator while it evaporates instantly upon application of the aforesaid capacitor discharge.

What I claim is:

1. In an electrostatic dust precipitator including a bank of electrodes, a power supply adapted to provide said bank of electrodes with a charge to ionize dust particles passing therethrough, fuse means connected between each of said electrodes and said power supply, and means for blowing any of said fuses which lead to a faulty electrode having a low voltage arc-over comprising a capacitor means for charging the capacitor with power from said power supply, and means for effecting a discharge of said capacitor through said faulty electrode whereby the energy stored in the capacitor discharging through the faulty electrode blows the fuse leading thereto.

2. In an electrostatic dust precipitator including a bank of electrodes, a power supply connected to said bank of electrodes for applying an ionizing charge to dust particles passing therethrough, fuse means connected between each of said electrodes and said power supply, and means for evaporating any of said fuses which lead to a faulty electrode having a low voltage arc-over comprising a capacitor and means for connecting the capacitor to the power supply and to said electrodes to charge the capacitor and effect an arc-over at said faulty electrode whereby the energy stored in said capacitor is caused to discharge through and evaporate the fuse leading to said faulty electrode.

3. In an electrostatic dust precipitator including a bank of electrodes, a power supply connected to said bank of electrodes for applying an ionizing charge to dust par-

ticles passing therethrough, fuse means connected between each of said electrodes and said power supply, and means for blowing any of said fuses which lead to a faulty electrode having a low voltage arc-over comprising a capacitor an inductance coil connected serially intermediate the capacitor and said electrodes, means for selectively connecting the capacitor to the power supply and to said electrodes to charge the capacitor and effect a discharge of said capacitor and an arc-over at said faulty electrode whereby the energy stored in the capacitor discharges through the arc-over path and blows the fuse.

4. In an electrostatic dust precipitator including a bank of electrodes, a power supply, a power lead between the power supply and the bank of electrodes adapted to

charge the electrodes and ionize the dust particles passing in proximity thereto, fuse means intermediate each of said electrodes and said power supply, means for blowing any of said fuses which lead to a faulty electrode having a low voltage arc-over comprising a capacitor, and means adapted to charge the capacitor and effect a discharge thereof whereby energy stored in the capacitor may be discharged through the faulty electrode to blow the fuse leading thereto.

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