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METHOD OF AND MEANS FOR ELIMINATING ELECTROSTATIC CHARGES IN INDUSTRIAL PROCESSES

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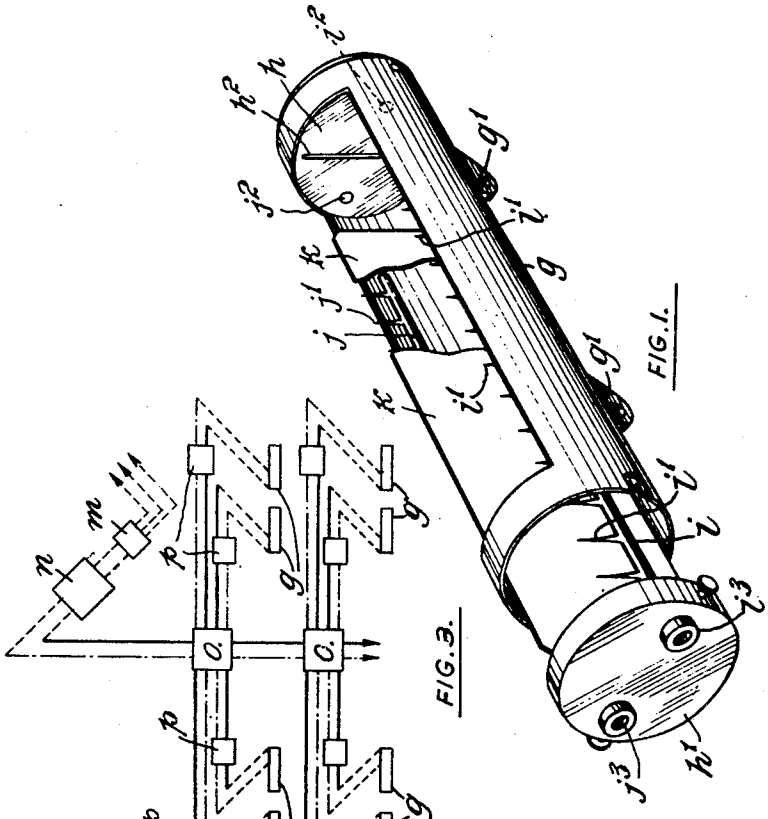

FIG. 1.

FIG. 3.

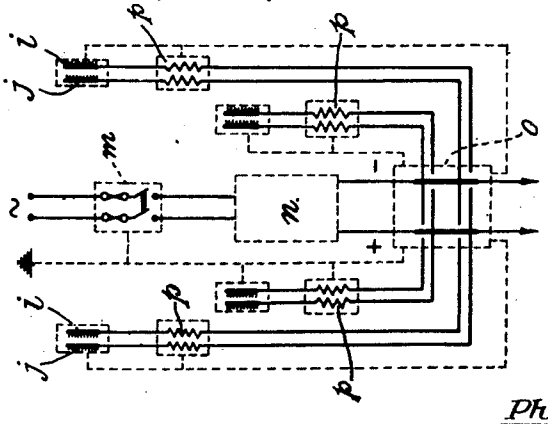

FIG. 2.

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METHOD OF AND MEANS FOR ELIMINATING ELECTROSTATIC CHARGES IN INDUSTRIAL PROCESSES

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This invention relates to the elimination of electro-static charges, generated in industrial processes, where they are detrimental, for example in the warping of cotton, rayon and other yarns. The invention makes use of the known principle of elimination by means of a point discharge to ionise the air in the region of the static charge to be eliminated.

Hitherto, such apparatus for this purpose has generally employed an A. C. discharge producing alternately with each half cycle, positive and negative ions from the same points. This has certain disadvantages the principal of which are capacity effects and the substantial recombination of the ions before they can be effective. Apparatus has, however, been known using a high D. C. voltage to charge the points and embodying a device whereby a D. C. voltage, necessarily inadequate for operating point discharge electrodes, is used to charge a condenser whose plates are periodically disconnected from the voltage supply and then separated, thus diminishing the capacity of the condenser and increasing the voltage to an adequate value to obtain a momentary point discharge. Inventions of this kind suffer the major disadvantage that there cannot be made available sufficient power without the use of inconveniently large and complicated apparatus. Apparatus has also been known in which a rectified A. C. supply is used to charge point discharge electrodes.

D. C. devices overcome to some extent the loss of efficiency due to recombination of the ions, but suffer from two defects:

1. That they give rise to the risk of overcompensating the charge which is to be removed, thereby depositing a charge of opposite sign.

2. That the discharge points being of one polarity they will only eliminate charges of opposite polarity.

The object of the present invention is to provide a new method of, and means for eliminating static charges, employing the point discharge principle.

The invention comprises the method of eliminating electro-static charges in industrial processes by means of point discharge to ionise the air in the region of said electro-static charge, wherein the points are charged from a high voltage rectified A. C. supply whereby the discharge voltage varies but little from a constant value, such drop as occurs between successive charging cycles being a function directly of the rate of discharge and inversely of the capacity of the circuit on the output side of the rectifier.

The invention also includes apparatus for carrying out the method aforesaid.

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The invention is capable of embodiment in either of two basic forms, viz.: (*a*) two electrodes, one positively charged and the other negatively charged and situated sufficiently far apart from each other and sufficiently close to the site of static-electricity to be discharged, so as to avoid appreciable recombination of ions taking place before these ions have been effective in discharging the static electricity. (*b*) Two electrodes, as in (*a*) above but relatively closer together for cases where for reasons of design of the machinery it is difficult to employ well-separated electrodes, the loss of efficiency arising from recombination of the ions due to bringing the electrodes closer together, being largely overcome by inserting between the electrodes a screen of insulating material such as cellulose acetate. The electrodes and screen can be mounted as a single unit. The use of such a screen under these conditions also reduces the current flowing between the electrodes and therefore in addition to increasing the range of the apparatus by eliminating recombination of ions, it also increases the number of electrodes that can be charged from the same rectifier unit.

The invention may include the use of safety resistances in the positive and negative branches of the circuit, contiguous to each pair of electrodes. Owing to the use of rectified A. C. and the consequent substantial absence of capacity effects in the leads no current has to be supplied by the apparatus other than that consumed by the electrodes and stray leakages. Consequently the high voltage current required to serve a large number of machines will not exceed a small value (of the order of one milliamp) and the high voltage power unit may be so constructed as to be incapable of passing more than this current. This greatly increases the safety of the apparatus.

In the accompanying drawings:

Fig. 1 is a similar view of a two electrode apparatus in accordance with one example of the invention;

Fig. 2 is a circuit diagram, and

Fig. 3 is a wiring diagram.

As shown in Fig. 1 the apparatus comprises an earthed conducting tube *g*, having lugs g^1 and being closed at one end by a disc *h*. Detachably fitting into the said tube is a second end disc h^1 carrying a pair of metal rods *i* and *j* each with discharge points i^1 and j^1 respectively. The ends of the rods *i* and *j* are adapted to be located and supported in holes i^2 and j^2 in the end disc *h*. Between the rods and secured at one end to the end disc h^1 is a diametrical insulating partition *k* of cellulose acetate the other

end of which is adapted to be located and supported in a slot h^2 in the end disc h. The disc h^1 carries sunk and shrouded terminal connections i^3 and j^3 respectively.

As shown in Figs. 2 and 3 an installation suitable for the elimination of electro-static charges generated in the warping of cotton or rayon yarns consists of a mains switch m connected to the terminals of an A. C. mains (e. g. 230 v. 50 cycles) and a transformer-rectifier unit n, of the kind known as a voltage doubler, capable of producing a high tension D. C. of 24,000 volts, centre-tapped to earth, thus providing 12,000 volts for positive or negative charge. The D. C. output is taken through a distribution box o and suitably branched therefrom to resistances p, one for each branch lead and thereafter to the point discharge rods i and j of a double electrode discharge unit shown in Fig. 1, each unit being on a separate warping machine. High insulation isolating switches or plugs, not shown, may be arranged between the resistances and the electrodes. The discharge units would normally be placed parallel to the axis of the warping mill, just in front of the place where the yarn is wound on to the mill. The diagonal portions of the wiring diagram, Fig. 3, indicate the vertical portions of the wiring. The discharge units are indicated as g in Fig. 3.

In use, there is only a small voltage loss across the resistances which are inserted for considerations of safety; so that a single power unit may be used to serve a widely dispersed set of machines.

We declare that what we claim is:

1. Apparatus for eliminating electro-static charges in industrial processes by means of point discharge to ionize the air in the region of said electro-static charges, comprising two separate sets of discharge points arranged side by side and relatively close to each other and located in said region, a source of high voltage for charging each set of points simultaneously but with opposite polarity, whereby positive and negative ions will be simultaneously discharged into said region, and a partition of insulating material separating the two sets of discharging points throughout the length of the sets so as to minimize recombination of the positive and negative ions.

2. Apparatus for eliminating electro-static charges in industrial processes by means of point discharge to ionize the air in the region of said electro-static charges, comprising two separate sets of discharge points arranged side by side and relatively close to each other and mounted in a single unit and located in said region, a source of high voltage for charging each set of points simultaneously with opposite polarity, whereby positive and negative ions will be simultaneously discharged into said region, and a partition of insulating material separating the two sets of discharging points throughout the length of the sets so as to minimize recombination of the positive and negative ions.

3. Apparatus for eliminating electro-static charges in industrial processes by means of point discharge to ionize the air in the region of said electro-static charges, comprising two separate sets of discharge points arranged side by side and relatively close to each other and located in said region, a source of high voltage for charging each set of points simultaneously but with opposite polarity, whereby positive and negative ions will be simultaneously discharged into said region, and a partition of insulating material separating the two sets of discharge points longitudinally of the sets so as to minimize recombination of the positive and negative ions, and a high electrical resistance interposed between each set of discharge points and the source of supply.

4. Apparatus for eliminating electro-static charges in industrial processes by means of point discharge from two separate electrodes each having a set of discharge points in proximity to each other and to the area to be treated, each set of discharge points being of opposite polarity and potential relative to earth, comprising a tubular cover of insulating material having a longitudinal aperture at one side, a partition of insulating material dividing the interior of said tubular cover and the said aperture longitudinally, and a set of discharge points within the said tubular cover on each side of the partition with the said discharge points directed towards the aperture.

5. Apparatus for eliminating electro-static charges in industrial processes by means of point discharge from two separate electrodes each having a set of discharge points in proximity to each other and to the area to be treated, each set of discharge points being of opposite polarity and potential relative to earth, comprising a tubular cover of circular cross-section and of insulating material having a longitudinal aperture at one side, a diametrical partition of insulating material dividing the interior of said tubular cover and the said aperture longitudinally and extending substantially to the missing periphery of that portion of the tube at the aperture, and a set of discharge points within the said tubular cover on each side of the partition with the said discharge points directed towards the aperture.

6. Apparatus for eliminating electro-static charges according to claim 5 characterized by disc-like ends of insulating material closing the ends of the tubular cover, and carrying the electrodes.

7. Apparatus for eliminating electro-static charges according to claim 5 characterized by disc-like ends of insulating material closing the ends of the tubular cover and carrying the electrodes, one of the disc-like ends being detachably secured to the cover and having the electrodes attached thereto to facilitate dismantling.

8. Apparatus for eliminating electro-static charges according to claim 5 characterized by disc-like ends of insulating material closing the ends of the tubular cover and carrying the electrodes, one of the disc-like ends being detachably secured to the cover and having the electrodes attached thereto to facilitate dismantling, and said disc-like ends being formed with diametrical grooves to receive and locate the partition.

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