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1,489,425

W. H. CHAPMAN

APPARATUS FOR NEUTRALIZING STATIC ELECTRICITY

Filed April 5, 1920

Fig. 1.

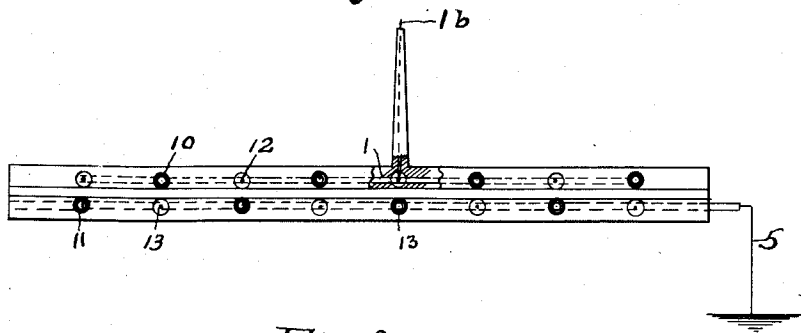


Fig. 2.

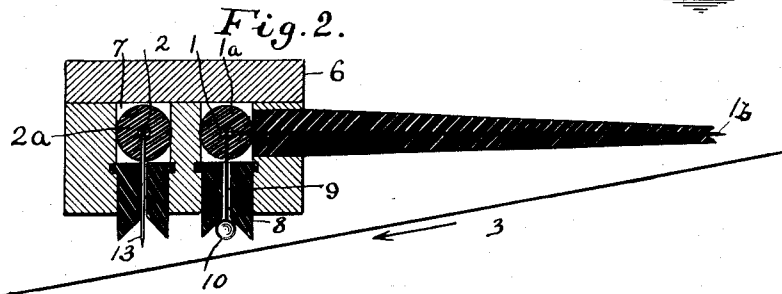


Fig. 3.

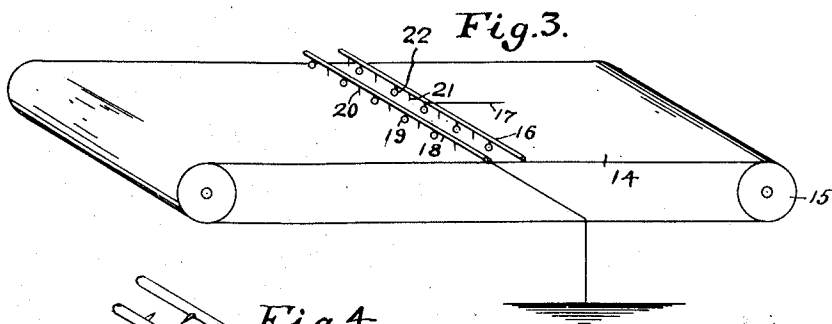


Fig. 4.

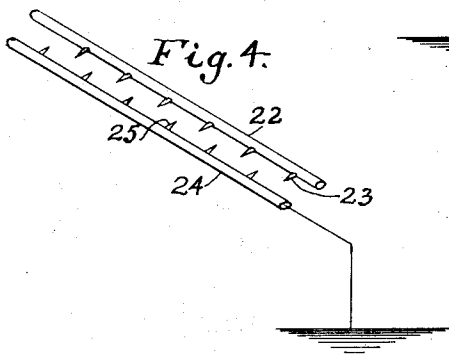
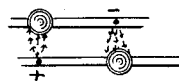


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM H. CHAPMAN, OF PORTLAND, MAINE.

APPARATUS FOR NEUTRALIZING STATIC ELECTRICITY.

Application filed April 5, 1920. Serial No. 371,497.

To all whom it may concern:

Be it known that I, WILLIAM H. CHAPMAN, a citizen of the United States, residing at 58 Fore Street, city of Portland, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Apparatus for Neutralizing Static Electricity, of which the following is a specification.

My invention relates to an apparatus for neutralizing static electricity in paper, wool cotton silk or other like material in process of manufacture or otherwise.

In my previous Patents Nos. 777,598, 777,599, and 824,339, I have shown how the charge of static electricity may be neutralized by the use of high tension electricity capable of throwing off from the discharging points a convective discharge both positive and negative, thereby forming a field which is charged with electric ions of opposite polarities.

The charge used may be either alternating in which both kinds of ions are radiated from the same points as shown in Nos. 777,598 and 777,599 or charges of a single polarity may be radiated from opposite points or fine surfaces as shown in No. 824,339.

In both these cases, the delivery of both kinds of electricity to the distributing points must be made from a transformer, or some source of high tension electricity and must be either alternating or of two opposing kinds.

In my Patent No. 940,428 I show a method of neutralizing the material by supplying only one kind of electricity and that of the same polarity as the charge material, the opposing kind being developed by induction on the opposite side of the paper treated and requiring careful adjustment to prevent leaving an overcharge in the material.

The object of my present invention is to provide means for neutralizing the charge on the material by a supply to the apparatus of electricity of either polarity indiscriminately applied in a way which makes the process perfectly automatic and does away with the need of any careful adjustments of the distributing points or conductors, the regulation of opposing charges being inherent in the construction of the distributing means.

The essential action in the previously mentioned electric neutralizing systems was the production of ions of both polarities in proximity to the charged material allowing the charge on the material to select for itself out of the ionized atmosphere the kind of ions which it needs to neutralize itself. The selection is made by the universal law of attraction for unlike and repulsion for like kinds.

According to my present invention, I provide a pair of conductors placed adjacent to each other and each having points capable of emitting a convective discharge and surfaces incapable of emitting such discharge, the points of one conductor being opposite to the surfaces of the other conductor. One of said conductors is grounded and the other connected to a source of high tension electricity of either or both polarities.

Thus, the points of the directly charged conductor are emitting ions of one polarity and the points of the other conductor are emitting ions of the opposite polarity which have been induced in the grounded conductor by the charge in the other conductor. There is thus created a field charged with ions of both polarities and if the material to be neutralized is passed through this field, neutralization takes place and this result is attained as explained, by supplying electricity of but one polarity which may, if desired, be taken directly from the material to be neutralized.

Where the device is to be used for treating moving material as paper in a web printing press I take the initial charge from the material itself by collecting the electricity on a suitable collector placed in advance of the neutralizing apparatus so that the material furnishes the electricity for its own neutralization.

My invention may best be understood by reference to the accompanying drawing in which is shown several forms of my invention which may be constructed in a great variety of ways.

In the drawing:

Fig. 1 shows a plan of an inductor bar taken from the under side, arranged to take electricity from moving paper and the like and connected to the ground,

Fig. 2 is an enlarged section of such a bar, Fig. 3 is a perspective diagram showing

the two conductors, one taking its charge from the paper to be neutralized and the other grounded,

Fig. 4 is a perspective of a bar in a simple form of construction but capable of doing the work and,

Fig. 5 is a diagram showing the emission of the ions from the discharging points toward the inducing surfaces. Similar figures of reference indicate similar parts.

Referring to Figs. 1 and 2 of the drawings, 1 represents an insulated conductor which is to be connected to a source of high tension electricity, and enclosed in an insulating cable.

As here shown, the conductor is connected with a branch 1^b which extends out from the bar to a position where it may collect a charge from the material which may be approaching the bar as the moving paper 3 in a printing press.

A second conductor 2 is located adjacent the conductor 1 and preferably parallel with it. This conductor is enclosed in an insulating cable 2^a.

The conductor 2 is connected with ground as indicated at 5. In the form shown in these two figures, the two insulated conductors are enclosed in a single bar made up of wood or other suitable material which may be used conveniently on a printing press or other machine where moving paper or other material is to be freed from static electricity.

As here shown, I make use of a bar 6 preferably of wood, having two parallel internal slots 7 running its entire length, each slot containing one of the insulated conductors 1 and 2 enclosed in its cable.

A series of insulating cylindrical plugs 8 extend through the face of the bar to the two cables. These plugs are centrally bored and each has extending through it a wire conductor 9 which connects at its inner end with one of the conductors 1 or 2, the outer end of each of the plugs 8 is provided with a cup-shaped recess and in this recess terminates the outer end of one of these branch or service conductors 9.

Of these branch conductors every alternate one is pointed at its outer end so that it is adapted to emit a convective discharge and each of the others terminates in a blunt or rounded surface, here shown as a ball. The balls on the conductor 1 are indicated by 10 and the points by 12 while the balls on the conductor 2 are indicated by 11 and the points by 13. The points on one of the conductors are opposed by the balls on the opposite conductor.

The operation of the device is as follows:—

The conductor 1 being charged, for instance, with negative electricity taken from the paper or otherwise, the balls 10 on the

conductor 1 induce positive electricity in the opposite grounded conductor and draw from the opposing points 13, positive ions. On the other hand, the points 12 emit negative ions which are attracted by the opposing balls 11 which have a ground connection.

There is thus set up a constant discharge of negative ions from the points 12 to the balls 11 and of positive ions from the points 13 to the balls 10 creating a neutralizing field which will neutralize any material which is brought within its influence. The neutralizing effect of those opposing ions extends some distance away as the electricity of the paper or whatever material is being acted upon tends to draw to itself ions of the opposite kind from the two kinds present, in proportion to the squares of the difference in voltage of the opposing kinds. Thus the bar will become effective to neutralize the electricity in paper or other material placed farther away than the distance the plugs are apart.

In Fig. 5 I have represented the discharge of ions across from the points to the balls but the direct course of the ions does not indicate the sphere of their activity as they may be drawn far out of their direct course when a body charged with either kind of electricity is brought to their vicinity.

It is immaterial from what source the electricity is drawn which is supplied to one of the conductors or what polarity it is or whether it be a high frequency alternating charge. The result is the same in kind in all these cases, although there is a difference in the distance through which the charges are able to operate. For instance, when positive is supplied to one of the conductors for neutralizing negative electricity, the neutralizing effect takes place at a greater distance than when negative is supplied. In the case of the positive, the effect may extend as much as 12 inches but with negative the distance is reduced to a few inches.

In Fig. 3, I have illustrated diagrammatically a case in which the initial charge is drawn from the material to be neutralized when the latter is in motion as, for instance, a web of paper.

In Fig. 3, 14 represents a web of paper running over rolls 15. A conductor 16 having balls 22 and points 21 is connected with a collector 17 terminating near the paper at a point from which it is approaching and far enough away to be beyond the influence of the neutralizing field. The opposing conductor 18 having balls 19 and points 20 is connected to ground.

As the paper approaches, charged with negative electricity, the pointed conductor 17 collects it and its first effect is to induce in the opposite conductor 18 a positive charge. The induced charge of positive is

drawn out from the points 20 across to the balls 22 and charges of negative are at the same time passing from points 21 to the balls 19.

5 While I have illustrated insulated conductors having branch conductors with rounded surfaces, the effect may be produced by more simple forms if the two adjacent conductors have points of convective
10 discharge and surfaces incapable of such discharge so that the charge in one conductor will produce by induction the opposite charge in the other conductor.

A simple form of the device is shown in
15 Fig. 4 in which two adjacent and parallel conductors 22 and 24 are shown, one of which may be connected to a source of electricity and the other grounded.

The conductor 22 has points 23 and the
20 conductor 24 has points 25. The opposing points in the two conductors are staggered so that each point comes opposite the rounded surfaces of the other conductor which acts to draw out the electricity from the
25 points.

The conductors may be exposed to the air and not covered with insulating material but so long as the convective discharge takes place they will create a neutralizing field.

30 According to this invention, the neutralizing of static electricity is reduced to the greatest simplicity and I am enabled to do away with the transformers and other expensive apparatus which I have hitherto
35 used in this business.

The radiating points may be pointed wires or wires of small diameter of any form so long as they emit a convective, sometimes
40 termed a corona discharge and produce the necessary ions and the surfaces which act by induction on the opposing conductors may be of any form so long as they are incapable under the tension being used, of throwing off electric ions.

45 I claim:

1. In an apparatus for neutralizing static electricity in a moving web or strand of insulating material, a pair of adjacent conductors both located on one side of said material and each having one or more bare inductive surfaces and one or more discharge points, the inductive surfaces of each conductor being placed in inductive relation to the discharge points of the other conductor, a pointed branch conductor connected to one of said conductors and extending beyond the inductive reach of the other conductor in the direction from which the moving material is approaching, the other conductor being connected to ground.

2. An apparatus for neutralizing static electricity which consists of a pair of adjacent conductors, each having a series of pointed offsets capable of emitting a con-

55 vective discharge alternating with rounded exposed offsets incapable of emitting such a discharge, the pointed offsets of one conductor being opposed to the rounded offsets of the other conductor, one of said conductors being connected to a source of static
70 electricity and the other conductor being grounded.

3. An apparatus for neutralizing static electricity which consists of an insulating bar, a pair of conductors enclosed in said
75 bar, each of said conductors having a series of offsets extending to the open air, a portion of said offsets having their outer ends terminating in points and a portion terminating in rounded surfaces, the points of
80 one conductor being opposed by the rounded surfaces of the other conductor, one of said conductors being connected with a source of static electricity and the other being grounded.

4. An apparatus for neutralizing static electricity for moving material which consists of a pair of adjacent conductors, each having one or more fine surfaces for emitting a convective discharge and other adjacent blunt or rounded uninsulated surfaces
90 for opposing convective discharge, one of said conductors being in communication with a source of static electricity and the other being grounded.

5. An apparatus for neutralizing static electricity in moving material which consists of a pair of adjacent conductors placed adjacent to said material, each having one or more fine surfaces for emitting a convective discharge and other blunt or rounded
100 uninsulated surfaces for opposing a convective discharge, one of said conductors being grounded and a pointed branch conductor connected to the ungrounded conductor and extending to a point adjacent to the moving material and far enough therefrom to be beyond the influence of said convective discharge.

6. An apparatus for neutralizing static
110 electricity for moving material which consists of a pair of adjacent conductors, each having a series of pointed offsets for emitting a convective discharge, alternating with rounded uninsulated offsets for preventing
115 such a discharge, the pointed offsets of one conductor being opposed to the rounded offsets of the other conductor, one of said conductors being connected to a source of high tension electricity and the other conductor
120 being grounded.

7. An apparatus for neutralizing static electricity for moving material which consists of an insulated bar, having therein a pair of parallel and adjacent conductors,
125 two rows of central perforated insulating plugs branching from said conductors, each of the plugs containing a branch conductor,

connected with one of the main conductors and having its outer end terminating in the air, every alternate branch conductor terminating in a point and the others terminating in a rounded surface, the points in one conductor being opposed to the rounded surfaces in the other conductor, one of said conductors being connected with a source of static electricity and the other being grounded. 10

In testimony whereof I have affixed my signature.

WILLIAM H. CHAPMAN.