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W. H. CHAPMAN.

METHOD OF NEUTRALIZING STATIC ELECTRICITY.

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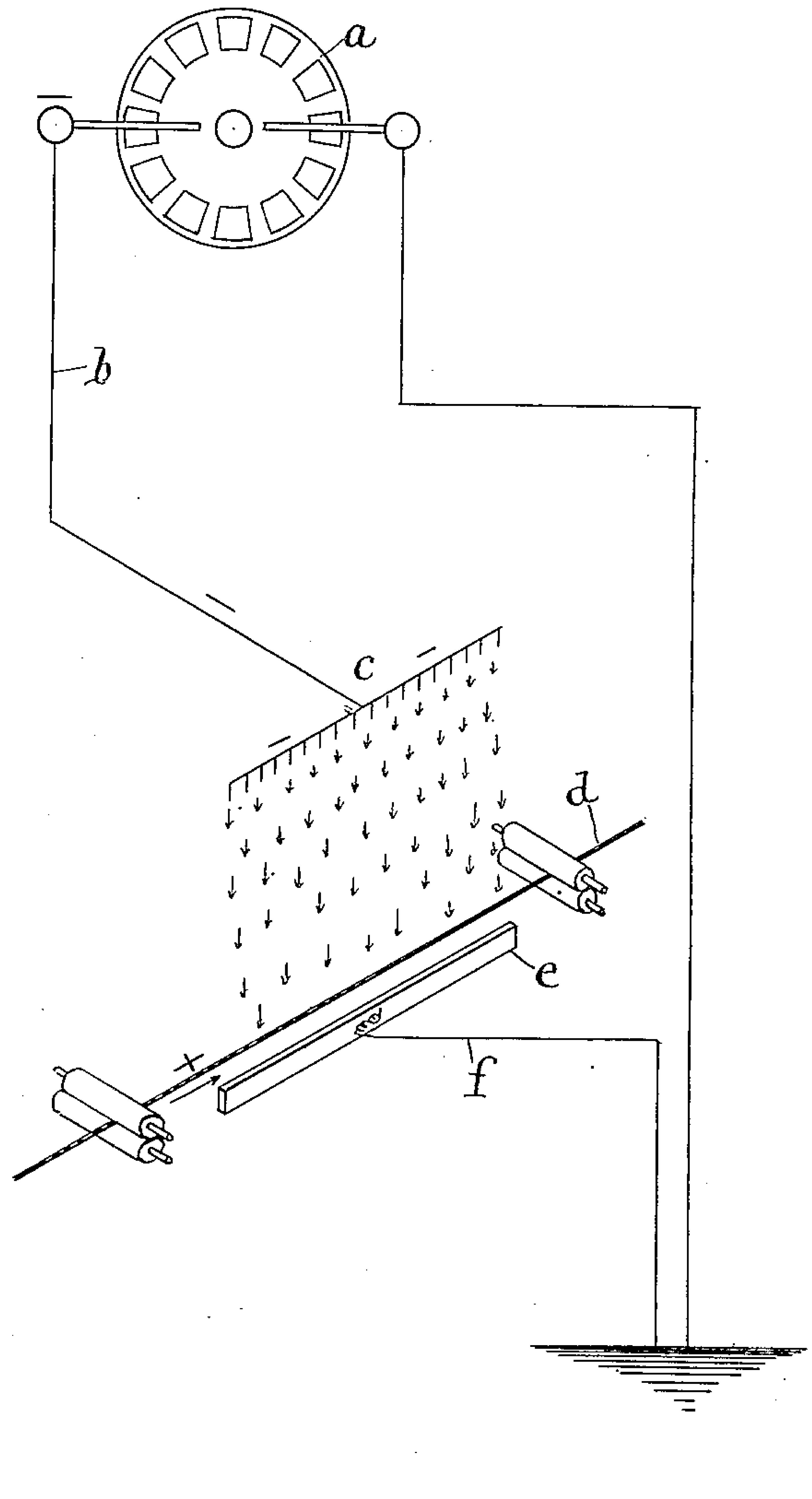

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UNITED STATES PATENT OFFICE.

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METHOD OF NEUTRALIZING STATIC ELECTRICITY.

No. 878,273. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed May 25, 1906. Serial No. 318,772.

To all whom it may concern:

Be it known that I, WILLIAM H. CHAPMAN, a citizen of the United States of America, and a resident of Portland, Maine, have invented certain new and useful Improvements in Methods of Neutralizing Static Electricity, of which the following is a specification.

My invention relates to a process of neutralizing static electricity particularly in yarn, roving, sliver and other like material produced during the processes of textile manufacture when it is not essential to remove the entire charge and when it is not practicable to locate the parts of the apparatus used very near the work.

In the manufacture of textile fabrics the cotton, wool or mohair and other fiber is carded, spun, twisted &c. and becomes charged with positive electricity at various points in the process of its manipulation, the charge being usually imparted to it where it passes through rolls and is subjected to a drawing or compressing action. The electric charge when it is comparatively low in voltage has little or no bad effect on the fiber but when it reaches a high voltage the fibers repel each other causing unevenness in spinning or twisting &c., or they may stick to the rolls or other parts of the machinery and thus cause trouble.

When the material to be acted upon is paper or other material where it is important to effect the complete neutralization and where the neutralizing apparatus may be located close to the work I make use of an alternating charge of high voltage as set forth in my Patent No. 777,598.

When it is not objectionable to leave a charge of a few hundred volts in the material and where the apparatus cannot be approached near the work I find it advantageous to use a direct current for the reason that the discharge from a direct current carries much farther than that from the alternating current, the discharge of electric ions which produce the neutralization being effective as far as two feet or more from the discarging point.

In the present invention I make use of a conductor containing small points or surfaces which is charged with a direct current or charge of high voltage and of a polarity which is of opposite sign to the electricity of the material to be treated. From this conductor takes place a static discharge of electric ions which radiate to the material and effect its neutralization. Hitherto in using the direct current for this work the discharging conductor for discharging the high voltage electricity has been located close to the work and when so located it was practically impossible to prevent overcharging the material with electricity from the charged conductor. The reason for this was because the amount of electricity was constantly varying in the material and no ordinary means of adjustment would be effective to put just the right quantity into it and if enough was put in to neutralize the static electricity there was quite sure to be an over plus. Thus the difficulty with this process has been to control or limit the discharge of electric ions so that they would neutralize substantially all the electricity of the material without putting into it an overcharge of electricity of opposite polarity. This limitation or regulation I have accomplished by means of the process set forth in my application No. 292,388 filed Dec. 18, 1905 in which I interpose between the charged conductor and the material a perforated metal plate or screen connected to earth, and in the process shown in application No. 309,352 filed April 2, 1906 in which I inclosed the conductor within a grounded slotted tube having a slot of a width proportional to the distance away of the material to be acted upon.

I have now discovered that the automatic regulation of the direct charge may be effected by locating the charged conductor at a comparatively long distance from the material to be acted on and locating within the range of influence of the direct charge a grounded conductor which will be in such relation to the charged conductor and the material that the tendency of the ions when the material is charged with static electricity will be to go to the material and so neutralize the contained charge but when the material is neutral or nearly so the ions will go more readily to the grounded conductor leaving the material in a substantially neutral condition. The exact location of these elements depends upon the voltage of the conductor, the speed of the moving material and the position of the grounded conductor but in general it may be said that the charged conductor when its charge is 10,000 volts or over should be at least farther away than 6 to 8 inches and the greater the distance up the point where it ceases its effect, the better it works.

The material, in order to get the best results should be separated from the grounded conductor or be of such loose nature as not to come into too intimate contact with it; otherwise the material will have when in contact with the grounded conductor, a condenser effect and its selective power will be thus reduced. The latter must also be located where it will receive the direct discharge from the conductor and should not be screened therefrom. Thus, when the charged conductor is 18 inches or 2 feet away from the yarn, with a voltage of 10,000 volts, the grounded conductor may be near the yarn but not in intimate contact with it and in the range of the direct discharge of the ions and when the parts are in this position the positive electricity generated in the yarn will be neutralized without the yarn receiving an overcharge of negative from the charged conductor. The reason is this;—So long as the yarn contains any positive electricity it tends to draw to itself the negative ions which are being thrown off by the charged conductor and this tendency is proportional to the square of the difference of the voltage between the two kinds of electricity.

When the yarn becomes neutral the grounded conductor offers the path of the least resistance and the ions consequently go that way instead of to the neutral yarn. If the yarn receives a slight overcharge of negative ions it tends to repel these ions to the grounded conductor and prevent the accumulation of negative ions on the yarn. When the parts are located at certain relative positions there will be a perfect neutralization of the charge in the material but ordinarily in textile work it is not important to take out the entire charge and there is consequently considerable latitude in the arrangement of parts.

I illustrate my invention by means of the accompanying drawing in which is represented diagramatically an apparatus adapted to carry out my process.

In the drawing *a* represents a Wimshurst machine or other source of direct current of high voltage electricity connected by a wire *b* which may be an insulated cable with a conductor *c* having small radiating points or surfaces. This conductor *c* may be made up in any desired way so long as it has fine discharging points. *d* represents a strand of yarn moving along through rolls whereby it is charged with high tension electricity and it is located at a considerable distance from the conductor. The material treated may be yarn in the process of spinning, roving, sliver or other material containing a static charge which it is desired to remove.

Located adjacent to the yarn *d* and within the range of influence of the conductor *c* is a conductor *e* connected to ground by the wire *f*. This conductor may be a piece of metal specially used for this purpose or the metal of the machinery may sometimes serve the purpose if it is properly located.

The discharge of the ions is represented as going from the conductor *c* to the yarn and as already stated, the tendency of the negative ions to go to the positively charged yarn is greater than it is to go to the grounded conductor but as soon as the yarn is neutralized the conductor *e* attracts them more readily than the yarn.

It is essential to have the conductor *c* relatively far away from the yarn for if it is placed too near it tends to overcharge the yarn and it will not be diverted by the grounded conductor.

The process is very simple and effective in textile mills, particularly in mill rooms where the atmosphere has to be kept very moist and the temperature very high to prevent the generation of static electricity in the fiber in process of manufacture.

By the use of my invention it is practicable to do away with the hot and humid atmosphere in cotton and other textile mills and to produce better and more uniform work, and a mill equipped with my apparatus is independent of climate or weather conditions.

Instead of using a direct current I may use an alternating current composed of alternations which are in greater part of a polarity opposite to that in the material but I do not find such a current effective through so great distance as the direct current.

I claim:—

The herein described process of neutralizing static electricity in yarn or other like moving material which consists of subjecting the material to the action of a charge of high voltage electricity radiated from one or more discharging points, said electricity being of a polarity wholly or in greater part opposite to that of the electricity in the material and placing a grounded conductor at such a point as described with relation to the charged conductor and the material that it will divert or attract the electricity of said charge when the material is in a substantially neutral condition, but not otherwise.

WILLIAM H. CHAPMAN.

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