

P. RASEHORN & G. GROSSMANN.
 APPARATUS FOR NEUTRALIZING ELECTRIC CHARGES IN FIBROUS MATERIALS.
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1,154,127.

Patented Sept. 21, 1915.

Fig. 1

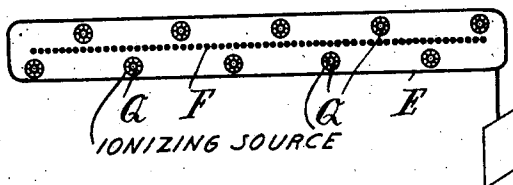


Fig. 2

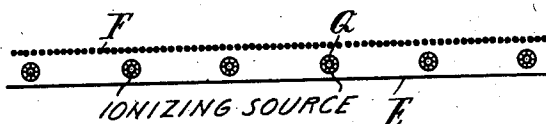


Fig. 3

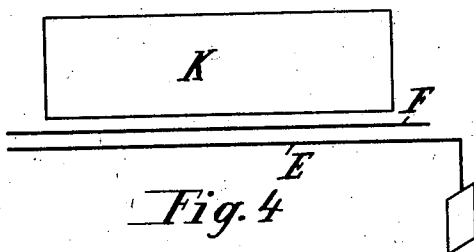
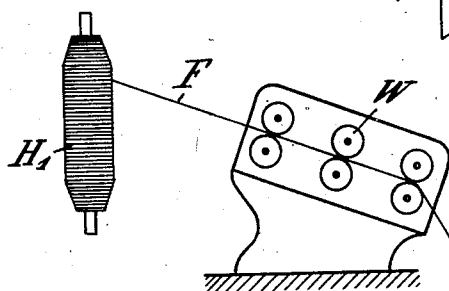
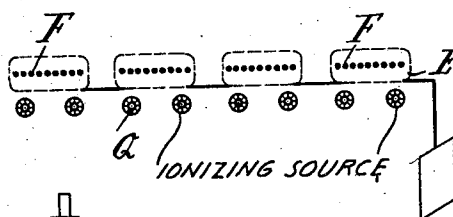
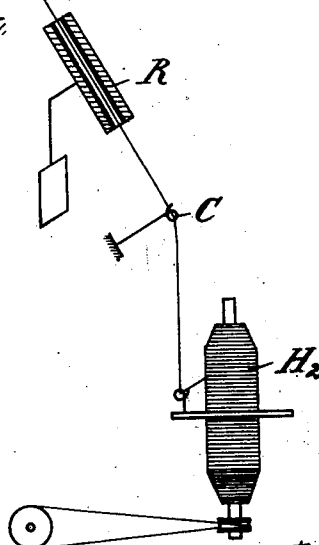


Fig. 5



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR NEUTRALIZING ELECTRIC CHARGES IN FIBROUS MATERIALS.

1,154,127.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, PAUL RASEHORN, a citizen of the German Empire, and GUSTAV GROSSMANN, a subject of the King of Hungary, and residing, respectively, at Halensee, near Berlin, and Charlottenburg, near Berlin, Germany, have invented a certain new and useful Improved Apparatus for Neutralizing Electric Charges in Fibrous Materials, of which the following is a specification.

Our invention relates to an apparatus for neutralizing the electric charges which accumulate in fibrous materials when being manufactured or worked.

To neutralize the electricity which collects in fibrous materials when being manufactured or worked, as *e. g.* in threads and woven material during spinning or weaving, and in paper while pressing, two different methods are employed. Either the same quantities of electricity of opposite sign are supplied to the electrified material, or the material to be neutralized is exposed to an electric field in which the currents flow out from points. With the first-named method complete neutralization cannot be obtained because the quantity of electricity collecting in the fibrous material is variable and consequently is not exactly known. This results in the fibrous material after the completion of the neutralization process being provided either with a partial charge or, in the event of over-compensation occurring, with an electric charge of opposite sign. The second method named is disadvantageous inasmuch as the material to be neutralized is in an electric field of large fall of potential so that the persons engaged in working with the material must move wholly or partly within a high tension electric field and be consequently exposed to a danger to life. Moreover this method has been found disadvantageous in that excellent insulation of the high tension conductors in these particular plants is not well attainable owing to the large percentage of moisture always present in the air.

A primary object of our invention is to obviate the defects of the aforementioned processes, and to this end we arrange that the electric charges are neutralized by being conducted directly away by means of a medium which is ionized by means of light rays

having ionizing properties, the medium being preferably gas or air.

Our novel apparatus can be constructed by arranging in the vicinity of, or around the fibrous material to be neutralized a grounded conductor in the form of a plate, net, box, tube, or the like, and by exposing the air between the fibrous material and the grounded electrode to the action of a source emitting light rays of ionizing character. To this class of rays according to the present art of physics belong ultra-violet rays, cathode and Röntgen rays, or rays emanated from radioactive substances. These rays have in common that they are light rays proper, and that they are possessed of the characteristic property of rendering air conductive by true ionization, these facts being acknowledged by all physicists. To produce ultra-violet rays electric sparks may be employed which are caused to pass preferably between aluminium electrodes, the latter being supplied from a high-pressure source, *e. g.* from a high-pressure transformer or induction coil. It is more preferable to employ for producing the ultra-violet light mercury-lamps, *e. g.* quartz lamps, especially as for operating them low voltage currents are employable. Very powerful ultra-violet rays can be also obtained with the aid of an electric arc passing between iron electrodes. Also cathode rays or the Lenard rays which pass out of a cathode tube through an aluminium window may be employed. Moreover Röntgen rays are very effective ionizers, the soft types of ray being preferable; in addition, the secondary Röntgen rays which arise owing to the primary rays rebounding on solid bodies, may be employed. The radioactive substances most suitable are those which emit chiefly α rays, as these rays cause the most powerful ionization. There may be employed radioactive minerals, as *e. g.* pitchblende, chalcocite, carnotite, antunite, monarite and the like, the uranium, thorium and actinium salts obtained from these, as well as metallic actinium, polonium, uranium, thorium, radium, and the various derivatives of these, as *e. g.* the very stable radium D or radium F. Besides these powerful ionizing agents, weaker radioactive substances can be employed, such as *e. g.* the radioactive soils (fango, mud, radium mud), in addition, the

waste products produced when producing the above materials, and also the radioactive substances deposited or precipitated either by electrical or chemical means. When employing the radioactive substances emitting α rays care must be taken that the distance of such substances from the fibrous material is made greater or at least equal to the range of the rays emitted from them so as to be able to make use of the whole of the available ionic energy. A powerful ionization can also be obtained with radioactive substances which emit chiefly the slow β rays, as *e. g.* mesothorium, thorium A and the like. In most cases the ionizers are arranged near the electrified fibrous material, so that they act directly upon the latter or upon the space between this material and the grounded conductor.

The accompanying drawings diagrammatically illustrate by way of example some means for carrying out the process according to our invention.

In these drawings:—Figure 1 is a sectional view showing the fibrous material passing through an electrode surrounding the same, Fig. 2 is a similar view, the electrode being however of plate form, Fig. 3 shows an alternative arrangement wherein a perforated electrode is located between the ionizers and the said material, Fig. 4 shows a further arrangement wherein the ionizers are located in an inclosed casing having apertures close to the said material, and Fig. 5 illustrates, partly in section, a portion of a spinning machine provided with a tube-like electrode surrounding the thread and containing the ionizer.

Fig. 1 illustrates one form of apparatus. Here F indicates in section the fibrous material to be neutralized, E a grounded box-like electrode which may be formed of a constructive portion of the working machine and Q the ionizers (quartz lamps, Röntgen tubes, bodies formed from radioactive substances or the like). Instead of employing special bodies made from radioactive substances it is generally desirable to arrange the radioactive substance as a continuous coating on the electrode.

Fig. 2 shows an arrangement in which the fibrous material is exposed only on one side to the action of the ionized atmosphere. In this case the electrode E is of plate form. Moreover the box-like or plate-like electrodes may consist of a wire network or of perforated sheet-metal and the ionizing medium may be located outside it. An example of this arrangement is shown in Fig. 3, the fibrous material in various portions being here conducted through a number of tubular networks, and the sources of the rays being arranged outside the networks.

In general the ionizers emitting the ultra-violet rays will be arranged in a space closed

in itself in order to protect them from being touched either unintentionally or maliciously. Also the spark-gap for producing the ultra-violet light may be inclosed together with the generator in a casing which has, near the spark-gap, a quartz-glass window through which the rays can pass outwardly. In the same way the cathode or Röntgen tubes together with that source of current which supplies them may be placed in a casing which is closed on all sides, and which contains adjustable apertures for the passage of the operative rays and which further simultaneously serves for screening the rays which are injurious to persons. Fig. 4 shows an example of such an apparatus. Here F is the fibrous material to be neutralized, E a grounded plate-like electrode and K a casing in which the ray-producer is mounted, the latter, by means of one or more windows arranged at the bottom, sending out the rays serving to ionize the air.

Fig. 5 shows a form of apparatus for neutralizing the threads in spinning machines. Here H₁ is a spindle off which the thread F is wound, to be thereupon led through drawing-rollers W, thence through a guide C and then to be wound on the spindle H₂. After passing the last pair of drawing-rollers, the thread, in order that the electricity which it has collected owing to its contact with the drawing-rollers may be neutralized, is led through a grounded tube R which in its inside is provided with a coating of a radioactive substance. This tube can be formed in one or two parts, in the latter case the threads in the event of breakage, not needing to be threaded through the tube. The electrode, *e. g.* the tube R, arranged in the vicinity of the thread or fibrous material may be given a different potential to the earth potential, preferably such a potential that the desired discharge is accelerated. The fibrous material may also be brought directly into contact with the radioactive substances, so that the said material itself becomes radioactive. Also a portion of the drawing-rollers, *e. g.* in the roller-train (W in Fig. 5), may be provided with a coating of radioactive substance, so that the threads themselves which are led through the rollers may become radioactive.

A further way of carrying out our process consists in surrounding the fibrous material with box or tube-like electrodes and causing ionized air to enter the box or tube at a place outside the same, in some cases at a place remote from the same, and to stream through this box or tube. When porous materials or those composed of several threads separated one from another are employed, the ionized air may be blown transversely through such material toward an electrode. Moreover an ionizing emanation may be mixed with the stream of air.

The duration of the action of the ionized air on the fibrous material, *i. e.* the length of the path along which the former acts on the latter, the rate of advance of the material, the speed of the flowing ionized gas, and the strength of ionization are adjusted to suit the extent of the charge to be neutralized.

We claim:—

10 1. In combination with a machine for working fibrous material, a source of ionizing rays for neutralizing the electric charges of fibrous material passing through said machine, and an electrode for collecting and
15 carrying off said charges, said source being located between said material and said electrode.

20 2. In combination with a machine for working fibrous material, a source of ionizing rays for neutralizing the electric charges of fibrous material when passing through said machine, and an electrode for collecting the electric charges from said fibrous mate-

rial, said source of rays being applied to said electrode in the form of a coating and placed 25 between said fibrous material and said electrode.

3. In combination with a machine for working fibrous material, a source of ionizing rays for neutralizing the electric charges 30 of fibrous material when passing through said machine, and a perforated electrode for collecting the electric charges from said fibrous material by means of the interposed ionized air, said perforated electrode being 35 placed in the form of a screen between said neutralizing means and said fibrous material.

In testimony whereof we have signed our names to this specification in the presence of 40 two witnesses.

PAUL RASEHORN.
GUSTAV GROSSMANN.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.