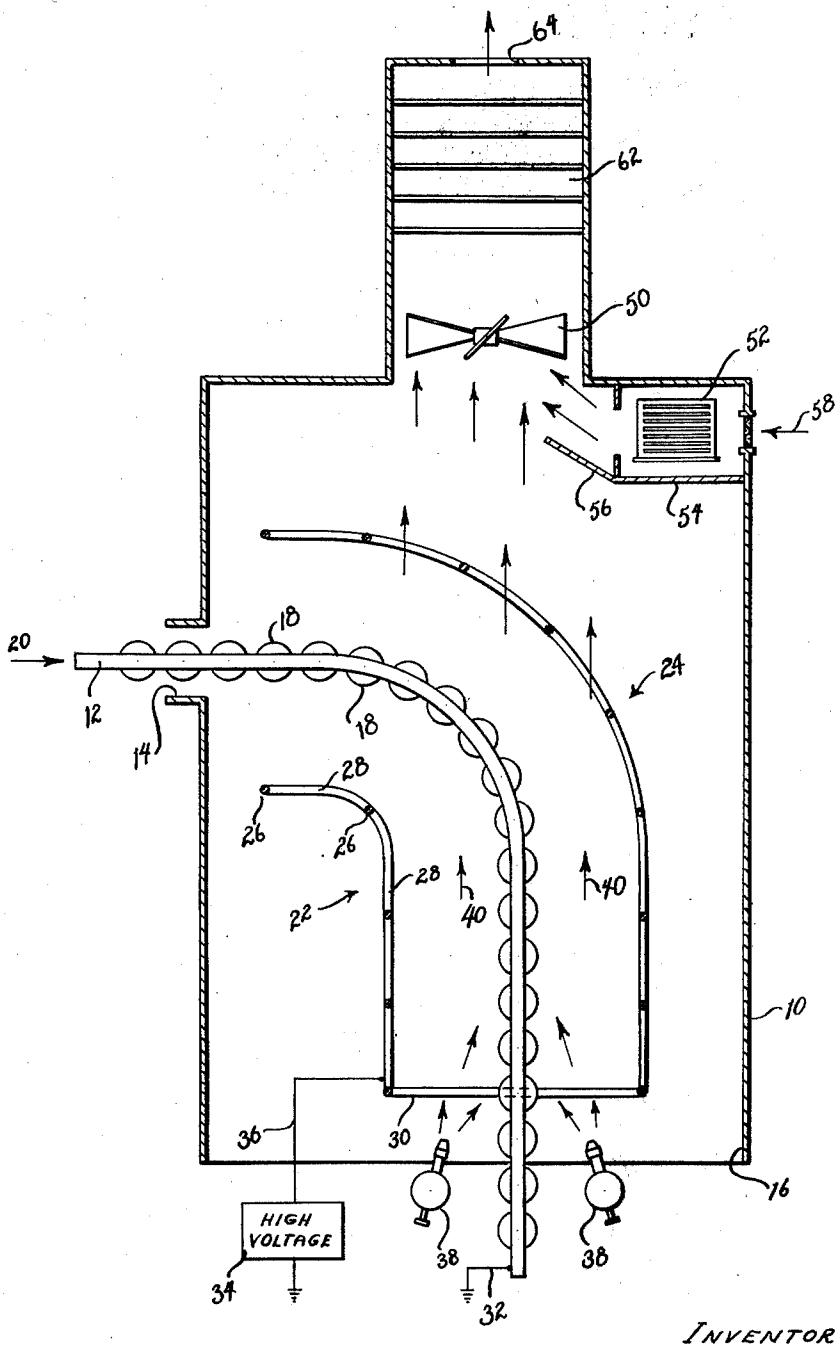
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METHOD AND APPARATUS FOR CONTROL OF CHARGED PARTICLES IN ELECTROSTATIC MACHINES

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METHOD AND APPARATUS FOR CONTROL OF CHARGED PARTICLES IN ELECTROSTATIC MACHINES

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This invention relates to a method and apparatus for control of charged particles in electrostatic machines, and, more particularly, to a method and apparatus for removing unwanted or excess charged particles from such machines. The novel features of this invention may be used in various applications and are especially applicable to use in paint spraying, wherein paint particles are electrostatically deposited upon the articles being coated. The method and apparatus of the invention will be described in conjunction with such paint spraying apparatus; however, it is to be understood that the scope of the invention is not limited to this function.

In an electrostatic paint spraying machine, the articles being coated are usually carried through the painting zone on a conveyer of some type. The paint is applied to these articles by conventional spray guns. In order to cover articles having curved surfaces, indentations, and the like, it has been found desirable to create an electrostatic field in the spray zone. In such an apparatus, the articles being painted are maintained at ground potential and the spraying zone is enclosed with electrodes which are maintained at a high potential with respect to ground. The paint particles projected into the electrostatic field become charged and those which do not directly impinge upon the articles being coated will flow past the articles and be attracted to the various surfaces thereof due to the electrostatic field terminating thereon. This has proved to be a very successful method of coating articles. However, because of their charged condition, the excess particles which do not adhere to the desired article eventually adhere to some other portion of the apparatus even though they are dry. Layers of these unwanted particles build up on the various surfaces of the paint spraying equipment, necessitating frequent shutdowns for removal thereof.

It is an object of this invention to provide a method and apparatus for the control of the excess charged particles present in a paint spraying apparatus which does not require shutdown of the apparatus or other expensive maintenance operations. It is a further object of the invention to provide a process and apparatus of such a nature in which the excess particles are changed to a dry powder so that they may be removed from the apparatus without requiring removal or substitution of portions of the apparatus.

These objects are accomplished in the present invention by mixing a quantity of a neutralizing agent, such as ozone, with the excess charged particles being exhausted from the spraying zone. Then the stream of air containing the now-neutralized paint particles is passed through a baffle in which the particles are separated out by action of gravity, the particles falling into an ash pan, or the like, from which they may be easily removed.

Other objects of the invention and novel details of construction and novel combinations and arrangements of parts will more fully appear in the course of the following description.

The drawing is a diagrammatic, horizontal sectional

view of an embodiment of an apparatus used to practice the method of the invention.

As shown in the drawing, a paint spraying booth **10** has a conveyor rail **12** passing in through an opening **14** and out through a second opening **16**. A plurality of articles **18** which are to be painted are transported along the conveyer **12**, preferably in the direction indicated by the arrow **20**. A pair of electrodes **22**, **24** are positioned respectively on each side of the conveyer **12** and spaced therefrom. Each electrode may consist of a plurality of vertical rods **26** interconnected by a plurality of horizontal rods **28**, the two electrodes **22**, **24** being interconnected by a conductor **30**. The conveyer **12** is connected to circuit ground by a conductor **32**, and the electrodes are connected to a source of high voltage **34** by another conductor **36**. Means not shown in the drawing are used to provide an electrical contact between the articles **18** being painted and the conveyer **12**.

Paint is sprayed in small particles into the zone between the electrodes through one or more conventional spraying nozzles **38**. The electrostatic field existing between the articles **18** and the high voltage electrodes **22**, **24** cause the major portion of the atomized paint particles to be deposited upon the articles, the particles travelling through the zone between the electrodes in the general direction indicated by the arrows **40**.

Those paint particles which are not deposited upon the articles **18** move out of the spraying zone passing between the elements of the electrode **24**. The velocity imparted to the particles by the spray guns will produce this movement; however, it is preferable to employ an exhaust fan **50** at the end of the booth opposite the spray guns **38** to create a stream of air moving through the booth. Those paint particles which are not deposited upon the articles **18** are drawn out of the booth by this stream of air.

An ozone generator **52** is located in one corner of the booth **10**, being separated from the remainder of the booth by partitions **54**, **56**. A stream of air flows through the ozone generator in the direction indicated by the arrow **58**, the ozone containing air leaving the generator **52** being mixed with the stream of air carrying the charged paint particles before the latter passes by the exhaust fan **50**. The exhaust fan **50** may be used to provide air flow through the ozone generator also or a separate blower may be provided.

A baffle unit **62** is inserted downstream from the exhaust fan **50**, the baffle serving to slow down and deflect the air stream so that the now-neutralized paint particles may be separated from the air stream by the action of gravity. The air stream is exhausted from the apparatus through an opening **64**. The particles which are separated from the air stream are in the form of a dry powder similar to dust or ash, and may be collected in a suitable container positioned beneath the baffle section to be disposed of periodically.

When the electrostatically charged particles in the exhausted air are mixed with the ozone, the charges thereon and neutralized. The exact nature of the reaction occurring here is not fully understood. However, it is felt that the fact that ozone is a very strong oxidizing agent and is relatively unstable are the characteristics thereof which make it suitable for this process.

Thus, it is seen that by the process of the invention most of the charged particles which are not adhered to the articles to be painted are drawn off and neutralized before they can become attached to other surfaces in the spraying apparatus.

Although one exemplary embodiment of the invention has been disclosed and discussed, it will be understood that other applications of the invention are possible and that the embodiments disclosed may be subjected to vari-

ous changes, modifications and substitutions without necessarily departing from the spirit of the invention.

I claim as my invention:

1. A method of controlling particles suspended in a gas, including the steps of: creating electrostatic charges in the particles at a first zone; and neutralizing the particles by mixing a quantity of ozone with the gas at a second zone.

2. A method of controlling electrostatically charged excess particles in a coating apparatus, the particles being suspended in a medium, the method including the steps of: flowing the excess particles away from the article being coated; mixing a quantity of ozone with the excess particles; and reducing the rate of flow of the particles at a predetermined area so that the particles are separated from the medium.

3. A method of painting, including the steps of: moving an article to be painted through a painting zone; establishing an electric potential between a wall of the painting zone and the article; spraying paint particles into the painting zone; conveying excess paint particles out of the painting zone; and neutralizing any electric charge on the excess particles by mixing with such excess particles a gas containing ozone as a neutralizing agent.

4. A method of electrostatically coating articles including the steps of: positioning the articles to be coated in a coating zone; establishing an electrostatic field in the coating zone; projecting particles of a coating material into the coating zone; directing a stream of gas through the zone so that particles not impinging upon the articles are carried out of the zone by the stream; and adding a quantity of ozone as a neutralizing agent to the stream of gas after the stream leaves the zone.

5. In an apparatus for electrostatically coating an article, the combination of: a plurality of electrodes, said electrodes being spaced from each other and defining a zone therebetween; support means for positioning an article within said zone; an electrical power source coupled to said electrodes and to said support means, said source creating an electrostatic field in said zone; discharge means for projecting particles of a coating material, said discharge means directing said particles into said zone; an ozone source; and ducting coupling said ozone source with particles passing from said zone.

6. An apparatus as defined in claim 5, including fan means producing a stream of particle carrier gas in said zone, said stream carrying a portion of said particles from said zone, said ozone being mixed with said particles in said stream.

7. An apparatus as defined in claim 6, including baffle means and means directing said stream containing said particles which have been mixed with ozone through said baffle means, said baffle means changing the rate of flow of said stream so that said particles are separated from said stream.

8. In a device for painting an article, the combination of: means defining a painting zone; means for conveying an article to be painted through said painting zone; means for injecting a spray of paint particles into said painting zone; means for establishing an electric potential across said painting zone for electrically charging said particles; means for conveying excess charged particles from said painting zone; and means for mixing ozone with said excess particles after being conveyed from said painting zone for neutralizing the electric charge thereon.

9. In a device for painting an article, the combination of: means defining a painting zone; means for conveying an article to be painted through said painting zone; means for injecting a spray of paint particles into said painting zone; means for establishing an electric potential across said painting zone for electrically charging said particles; means for conveying excess charged particles from said painting zone; means for mixing ozone with said excess particles after being conveyed from said painting zone for neutralizing the electric charge thereon; and means for collecting said neutralized excess particles.

10. In a device for electrostatically coating an article, the combination of: means defining a coating zone; means for conveying an article to be coated through said coating zone; means mounted adjacent said coating zone for injecting particles of a coating material into said coating zone; means for establishing an electric potential across said coating zone for electrically charging said particles; means coupled to said coating zone for conveying excess charged particles from said coating zone; and means spaced from said coating zone for mixing a stream of ozone with said excess particles after being conveyed from said coating zone for neutralizing the electric charge thereon.

11. A method of controlling charged particles suspended in a gas in an apparatus for coating articles, including the steps of: moving the gas containing the particles to be controlled away from the articles being coated; and mixing a quantity of ozone with the gas and charged particles.

12. In an apparatus for controlling charged particles in a zone, the combination of: conduit means defining a flow path, one end of said flow path being adapted to be coupled to the zone; exhaust means coupled to said flow path for creating a stream of the charged particles flowing from the zone along the flow path; ozone-producing means; means coupling said ozone-producing means to said flow path for mixing the ozone with said charged particles in said stream; baffle means; and means for coupling the other end of said flow path to said baffle means for directing said stream through said baffle means after said mixing occurs.

References Cited in the file of this patent

UNITED STATES PATENTS

977,335	Shoffner	Nov. 29, 1910
1,022,012	Whitney	Apr. 2, 1912
1,130,213	Steere	Mar. 2, 1915
2,297,933	Yonkers	Oct. 6, 1942
2,319,082	Neston	May 11, 1943
2,442,986	Ransburg	June 8, 1948
2,446,953	Ransburg	Aug. 10, 1948
2,722,908	Tuttle et al.	Nov. 8, 1955

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,847,324 August 12, 1958

Adam Ogint

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 59, for "and neutralized" read -- are neutralized --.

Signed and sealed this 28th day of October 1958.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

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