

PAINTER AND METHOD OF PAINTING

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The invention relates to a painter and a method of painting, and more particularly to a painter and a method of painting in both of which static electricity is removed from air, and then, the air is mixed with a paint.

DESCRIPTION OF THE PRIOR ART

For instance, when a paint is applied to a body of an automobile, there is sometimes generated non-uniformity in painting. It is known that such non-uniformity is caused by static electricity.

In general, static electricity is generated by friction between different materials. Hence, static electricity is already generated when a body of an automobile is puttied for pretreatment of painting.

In addition, static electricity is further accumulated in various polishing steps. For instance, since a bumper, one of parts of an automobile, is composed of insulating material such as plastic, when a polishing step is applied to a bumper, the bumper is completely electrically charged after the polishing step has been finished.

In particular, when a metallic-color paint is applied to an automobile, non-uniformity in painting is likely to be generated by static electricity. A metallic-color paint contains a lot of quite small metal particles. Since those metal particles are electrically conductive, if static electricity is accumulated on a body of an automobile, the metal particles are attracted to the static electricity. As a result, there is generated non-uniformity in painting on a body of an automobile.

In general, an object such as an automobile is painted by spraying a mixture of a paint and air thereto through a spray gun. Such air sprayed

through a spray gun is generally electrically charged. Specifically, when air flows through an air tube, air is electrically charged before sprayed through a spray gun, because of friction between air and an inner surface of the air tube. Since electrically charged air attracts ambient dusts, such dusts are resultingly adhered to an object to be painted with a paint.

Thus, in order to prevent non-uniformity in painting caused by static electricity, it is necessary to completely remove static electricity from an object to be painted, such as an automobile, or remove static electricity from air to be sprayed together with a paint through a spray gun.

It is generally easier to remove static electricity from air than to remove static electricity from an object to be painted. Hence, many apparatuses and methods have been suggested to remove static electricity when an object is painted. As an example of such apparatuses, the apparatus for removing static electricity, suggested in Japanese Utility Model Publication No. 3009802 published on April 11, 1995, is illustrated in Figs. 1 and 2.

As illustrated in Fig. 1, the apparatus is comprised of a filter 1 which removed moisture and oil from compressed air, a paint tank 2 filled with a paint, a gun 3 spraying a mixture of a paint and air, a high pressure hose 4 making fluid communication between the filter 1 and the gun 3, and a shield cable 5.

The filter 1, the high pressure hose 4 and the shield cable 5 are arranged in a box 10.

A leakage transformer 6 as illustrated in Fig. 2 is also arranged in the box 10. The leakage transformer 6 can raise a voltage supplied from a generally used AC power source up to about 7000 volts. The leakage transformer 6 includes a 10M Ω -resistor 7, three capacitors 8, and three discharge needles 9 each electrically connected to each of the capacitors 8, at its high voltage terminal. The discharge needles 9 are radially arranged in an outlet of the gun 3, and are arranged in facing relation to the high pressure hose 4 (not illustrated in Fig. 2).

The shield cable 5 includes a high-voltage terminal line and an earth

terminal line, and extends from the gun 3 to the leakage transformer 6 arranged in the box 10. The earth terminal line is electrically connected to a fixed terminal 12 through an earth line 11.

When a high voltage is applied to the discharge needles 9, electrons are ejected from the discharge needles 9, resulting in that air is accompanied with electron avalanche, and hence, there is generated corona discharge. As a result, positive ions and negative ions are alternately produced around the discharge needles 9. These positive and negative ions are sprayed through the gun 3 together with a paint by compressed air supplied through the high pressure hose 4.

Static electricity accumulated on an object to be painted is neutralized with the ionized air. At the same time, dusts having been adhered to the object are blown out.

However, the above-mentioned apparatus is accompanied with a problem that since air sprayed through the gun 3 has been already electrically charged when sprayed, the air attracts ambient dusts before reaching an object to be painted, resulting in that those dusts are adhered to the object.

SUMMARY OF THE INVENTION

In view of the above-mentioned problem in the conventional apparatus for removing static electricity, it is an object of the present invention to provide an apparatus and a method of removing static electricity from air when an object is to be painted with a mixture of a paint and air.

In one aspect of the present invention, there is provided a painter including (a) a static eraser which removes static electricity from air, (b) a tank containing a paint therein, and (c) a spray gun which mixes the paint with air supplied from the static eraser, and sprays the paint to an object, characterized by (d) a device located between the static eraser and the spray gun which device retains air therein, wherein positively or negatively charged ionized air supplied

from the static eraser is retained in the device, positively charged ionized air is mixed with negatively charged ionized air in the device, and electrically neutral air is supplied from the device to the spray gun.

The inventors of the present invention had found out that it is more effective to spray electrically neutral air than to spray positively or negatively charged ionized air, as done in the conventional apparatus illustrated in Figs. 2 and 3, in order to prevent non-uniformity in painting. If air is electrically neutral, the air will not attract dusts thereto when sprayed to an object to be painted.

The present invention is based on this discovery.

In accordance with the above-mentioned apparatus, while the positively or negatively charged ionized air supplied from the static eraser is being accumulated in the device such as a tank, the positively charged air is combined with the negatively charged air, resulting in that air becomes electrically neutral. The thus made electrically neutral air is sprayed through the spray gun together with a paint, ensuring non-uniformity in painting an object.

It is preferable that the device has a volume at least ten times greater than a volume of air discharged from the static eraser in a unit period of time.

If the device had a too small volume, it would not be possible to facilitate positively and negatively charged ionized air supplied from the static eraser, to combine with each other. Hence, the inventors had conducted the experiment to know how much volume the device had to have. In accordance with the experiment, it was found out that if the device had a volume ten times greater than a volume of air to be discharged from the static eraser in a unit period of time, it was possible to facilitate the positively and negatively charged ionized air to combine with each other. Accordingly, it is preferable for the device to have a volume defined as NV wherein N is an integer equal to or greater than 10, and V indicates a volume of air to be discharged from the static eraser in a unit period of time.

For instance, the device may be comprised of a tank for retaining air therein. As an alternative, the device may be comprised of a hose such as a high pressure tube.

In another aspect of the present invention, there is provided a method of painting an object, including the steps of (a) removing static electricity from air, (b) retaining positively and negatively charged ionized air resulted from the step (a), in a retainer, to thereby mix the positively and negatively charged ionized air to each other to render air electrically neutral, and (c) mixing the electrically neutral air with a paint, and applying the paint onto an object.

In accordance with the above-mentioned method, while the positively or negatively charged ionized air is being accumulated in the retainer, the positively charged air is combined with the negatively charged air, resulting in that air becomes electrically neutral. The thus made electrically neutral air is sprayed through the spray gun together with a paint, ensuring non-uniformity in painting an object.

It is preferable that the positively and negatively charged ionized air is retained in a tank in the step (b). As an alternative, the positively and negatively charged ionized air may be retained in a tube in the step (b).

The advantages obtained by the aforementioned present invention will be described hereinbelow.

In accordance with the present invention, while the positively or negatively charged ionized air supplied from the static eraser is being accumulated in the device such as a tank or a hose, the positively charged air is combined with the negatively charged air, resulting in that the air becomes electrically neutral. The thus made electrically neutral air is sprayed through the spray gun together with a paint, ensuring non-uniformity in painting an object.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a conventional apparatus for removing static electricity.

Fig. 2 illustrates the static eraser which is a part of the apparatus illustrated in Fig. 1.

Fig. 3 illustrates a painter in accordance with the embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment in accordance with the present invention will be explained hereinbelow with reference to drawings.

Fig. 3 illustrates a painter in accordance with the embodiment of the present invention.

A painter 20 in accordance with the embodiment is comprised of a static eraser 21 which removed static electricity from air, a paint tank 22 filled with a paint, a spray gun 23 in which air supplied from the static eraser 21 is mixed with a paint supplied from the paint tank 22, and which sprays the mixture of the air and paint, and a tank 24 located between the static eraser 21 and the spray gun 23 for retaining air therein.

For instance, the static eraser 21 in the embodiment may be comprised of the static eraser illustrated in Figs. 1 and 2. However, the static eraser 21 is not to be limited to that. Any apparatus which can remove static electricity may be used as the static eraser 21 in the embodiment.

The tank 24 has a volume ten times greater than a volume of air discharged from the static eraser 21 in a unit period of time.

The painter 20 in accordance with the embodiment operates as follows.

Positively and negatively charged ionized air 25 supplied from the static eraser 21 is once retained in the tank 24. The positively and negatively charged ionized air are combined with each other in the tank 24, resulting in that

the air 25 is turned into electrically neutral ions 26.

The thus made electrically neutral ions 26 are fed to the spray gun 23, and sprayed to an object through the spray gun 23 together with a paint supplied from the paint tank 22.

As mentioned above, in accordance with the painter 20, the positively or negatively charged ionized air 25 supplied from the static eraser 21 can be turned into the electrically neutral ions 26 by once retaining the charged ionized air 25 in the tank 24. By spraying the electrically neutral air 26 through the spray gun 23 together with a paint, it is possible to paint an object without non-uniformity in painting.

Though the painter 20 in accordance with the embodiment is provided with the tank 24 as the device for retaining air therein, the device for retaining air therein is not to be limited to the tank 24. Any means can be used as the device, if the means had such a volume as to be able to combine positively and negatively charged ionized air supplied from the static eraser 21. to each other to thereby render the air electrically neutral. For instance, a high pressure hose may be used in place of the tank 24, as the device for retaining air therein.

1. A painter (20) comprising:
 - (a) a static eraser (21) which removes static electricity from air;
 - (b) a tank (22) containing a paint therein; and
 - (c) a spray gun (23) which mixes the paint with air supplied from the static eraser (21), and sprays the paint to an object, characterized by
 - (d) a device (24) located between the static eraser (21) and the spray gun (23) which device retains air therein, wherein positively or negatively charged ionized air (25) supplied from the static eraser (21) is retained in the device (24), positively charged ionized air is mixed with negatively charged ionized air in the device (24), and electrically neutral air (26) is supplied from the device (24) to the spray gun (23).
2. The painter as set forth in claim 1, wherein the device (24) has a volume at least ten times greater than a volume of air discharged from the static eraser (21) in a unit period of time.
3. The painter as set forth in claim 1 or 2, wherein the device (24) is comprised of a tank for retaining air therein.
4. The painter as set forth in claim 1 or 2, wherein the device (24) is comprised of a tube.
5. A method of painting an object, comprising the steps of:
 - (a) removing static electricity from air;
 - (b) retaining positively and negatively charged ionized air (25) resulted from the step (a), in a retainer (24), to thereby mix the positively and negatively



charged ionized air to each other to render air electrically neutral; and

(c) mixing the electrically neutral air (26) with a paint, and applying the paint onto an object.

6. The method as set forth in claim 5, wherein the positively and negatively charged ionized air is retained in a tank (24) in the step (b).

7. The method as set forth in claim 5, wherein the positively and negatively charged ionized air is retained in a tube in the step (b).