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Electrostatic coating system and dual lip bell cup therefor
Elektrostatisches Beschichtungssystem und Sprühglocke mit zwei Kanten
Système de revêtement électrostatique et bol de pulvérisation à deux arêtes

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The invention relates generally to electrostatic coating systems, and more particularly to electrostatic coating systems having improved bell cups.

Electrostatic coating systems having rotating atomizing devices, some of which are known as bell cups, that dispense charged and atomized coating material toward target articles are known generally, as disclosed for example in U.S. Patent No. 5,622,563 entitled “Non-incendiary Rotary Atomizer”, which is assigned commonly with the present application.

Electrostatically charged coating materials dispensed from rotating atomizers, particularly metal and high speed non-metal non-incendiary bell cups, however have a tendency to wrap back around toward an outer side of the atomizer cup, which has an adverse effect on the transfer efficiency of the coating material.

An object of the present invention is to provide a rotary atomizer eliminating or substantially reducing the tendency of the charged and atomized coating material to wrap back around the side portions thereof, thereby remarkably improving coating material transfer efficiency.

The invention is defined by an electrostatic coating system rotary bell cup according to claim 1.

Another object of the invention is to provide novel electrostatic coating systems and rotating atomizing devices therefor and combinations thereof that are reliable and economical.

Another object of the invention is to provide novel electrostatic coating systems and rotating atomizing devices therefor and combinations thereof having improved efficiency.

A further object of the invention is to provide novel electrostatic coating systems and rotating atomizing devices therefor and combinations thereof that comply with industry safety standards.

Another object of the invention is to provide novel electrostatic coating systems and rotating atomizing devices therefor and combinations thereof that reduce the tendency of charged and atomized coating material to wrap back around the rotary atomizing device.

A more particular object of the invention is to provide novel electrostatic coating system bell cups comprising a non-conductive body member having an opening formed in an outer end thereof, a semiconductive member on a side portion of the body member, a first lip devoid of the semiconductive member disposed about the opening of the body member proximate the outer end thereof, a second lip disposed between the first lip and the inner end of the body member, the second lip disposed radially outwardly of the first lip.

Another more particular object of the invention is to provide novel electrostatic rotary atomizing devices comprising a non-conductive body member having an opening in an outer end thereof, a generally cylindrical first side portion extending from the outer end of the body member toward an inner end thereof, a generally cylindrical second side portion between the first side portion of the body member and the inner end thereof, a third side portion interconnecting the first and second generally cylindrical side portions, and a semiconductive coating on the second side portion of the body member, the first side portion of the body member devoid of the semiconductive coating.

Yet another more particular object of the invention is to provide novel electrostatic coating systems that dispense charged and atomized coating material from a rotary atomizing device, comprising a non-conductive body member having an outer end with an opening therefrom which the coating material is dispensed, the body member having a generally cylindrical first side portion with a first diameter, the first side portion of the body member extending from the outer end thereof toward an opposite inner end thereof, the body member having a generally cylindrical second side portion with a second diameter greater than the first diameter of the first side portion, the second side portion of the body member disposed between the first side portion of the body member and the inner end thereof, and a semiconductive coating on the second side portion of the body member, the first side portion of the body member devoid of the semiconductive coating.

These and other objects, aspects, features and advantages of the present invention will become more fully apparent upon careful consideration of the following Detailed Description of the Invention and the accompanying Drawings, which may be disproportionate for ease of understanding, wherein like structure and steps are referenced generally by corresponding numerals and indicators.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an electrostatic system according to the present invention.

FIG. 2 is an enlarged view of a portion of a rotary bell cup of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates an electrostatic coating system comprising an electrostatic applicator having a rotary atomizing device or bell cup that dispenses charged and atomized coating material toward a target article, not shown in the drawing, at an electrical potential, usually electrical ground potential, that is different from that of the coating material.
[0017] The system comprises a motor 30 or some other rotary drive member that imparts rotation to the rotary atomizing device 22, as disclosed for example in the referenced U.S. Patent No. 5,622,563 entitled "Non-incendive Rotary Atomizer", which is assigned commonly herewith and incorporated herein by reference.

[0018] The rotary applicator 20 is coupled to a high voltage source 40 for direct or indirect charging of the coating material, also disclosed in the referenced U.S. Patent No. 5,622,563 entitled "Non-incendive Rotary Atomizer".

[0019] In the exemplary embodiment, the bell cup 22 comprises a non-conductive body member 50 having an inner end 52 and an opposite outer end 54 with an opening 56 having a generally conical form in the exemplary embodiment disposed therein and from which the atomized coating material is dispensed.

[0020] The body member 50 is preferably formed of a resinous or a filled resin material, for example a glass filled polyetherketone (PEEK) or other suitable material, some of which are disclosed for example in the referenced U.S. Patent No. 5,622,563 entitled "Non-incendive Rotary Atomizer", but may also be formed of other non-conductive materials.

[0021] In FIG. 2, the exemplary body member 50 has a generally cylindrical first side portion 62 with a corresponding first diameter extending from the outer end 54 of the body member generally axially toward the inner end thereof. In the exemplary embodiment, the diameter of the first generally cylindrical side portion 62 of the body member increases toward the outer end 54 of the body member so that the first side portion 62 has a generally conical shape in correspondence with the generally conical opening 56 formed therein.

[0022] The body member 50 also has a generally cylindrical second side portion 64, with a corresponding second diameter that is greater than the first diameter of the first generally cylindrical side portion 62. In FIG. 1, the second side portion 64 of the body member is disposed between the first side portion 62 of the body member and the inner end 52 thereof.

[0023] The body member 50 generally comprises a first lip disposed about the opening 56 thereof proximate or on the outer end 54 thereof, and a second lip disposed radially outwardly of the first lip, between the first lip and the inner end 52 of the body member.

[0024] In FIG. 2, the first lip is formed at least partially by the outer end 54 of the body member and the first side portion 62 thereof. And the second lip is formed at least partially by the second side portion 64 of the body member and a third side portion of the body member between the second side portion 64 and the outer end 54 thereof.

[0025] In the exemplary embodiment of FIG. 2, the third side portion of the body member is a generally annular radial portion 66 of the body member located between and interconnecting the first and second side portions 62 and 64 thereof.

[0026] Alternatively, the third side portion 66 is not necessarily disposed radially from the axis of the bell cup as in the exemplary embodiment. The third side portion 66 may for example be a generally conical surface extending from the second side portion 64 toward the outer end 54 of the body member, and in one configuration it extends to the outer end 54 so that the first and third side portions form a common surface as indicated by phantom line 68.

[0027] A semiconductive member 70 is disposed on at least a portion of the generally cylindrical side portion of the body member 50. The semiconductive member is preferably a semiconductive coating or thin film applied to a portion of the body member, as disclosed in the referenced U.S. Patent No. 5,622,563 entitled "Nonincendive Rotary Atomizer".

[0028] The first lip of the body member is preferably devoid of the semiconductive coating. In the exemplary embodiment of FIGS. 1 and 2, the semiconductive coating is disposed on the second side portion 64 of the body member 50 but not on the first side portion 62 thereof. The third side portion 66 of the body member in the exemplary embodiment is also devoid of the semiconductive coating, but in some alternative embodiments the third side portion of the body member may include the semiconductive coating.

[0029] The spacing between the first and second lips, for example the difference between the diameters of the first and second side portions 62 and 64 of the body member as represented by the third side portion 66 thereof, and the axial dimension of the first side portion 62 of the body member devoid of the semiconductive coating material, are preferably selected to optimize the transfer efficiency of the coating material dispensed from the atomizing device 22. These particular dimensions however are application specific, depending for example on the geometry of the article to be coated and the properties of the coating material among other factors, and are readily ascertainable without undue experimentation by those of ordinary skill in the art based on the disclosure herein.

[0030] While the foregoing written description of the invention enables one of ordinary skill to make and use what is considered presently to be the best mode thereof, those of ordinary skill will understand and appreciate the existence of variations, combinations, and equivalents of the specific exemplary embodiments herein. The invention is therefore to be limited not by the exemplary embodiments herein, but by all embodiments within the scope and spirit of the appended claims.

Claims

1. An electrostatic coating system rotary bell cup (22) comprising:
   a non-conductive body member (50) having an inner end (52), an opposite outer end (54), and a side portion (62, 64);
   an opening (56) formed in the outer end of the
body member;
a semiconductive member (70) disposed on at least a portion of the side portion (64) of the body member (50);
characterized by
a first lip disposed about the opening (56) of the body member (50) proximate the outer end thereof,
the first lip is devoid of the semiconductive member (70);
a second lip disposed between the first lip and the inner end (52) of the body member (50), the second lip disposed radially outwardly of the first lip.

2. The bell cup (22) of Claim 1, characterized in that
the first lip is formed at least partially by the outer end (54) of the body member (50) and a first side portion (62) thereof, the first side portion (62) of the body member devoid of the semiconductive member (70).

3. The bell cup (22) of Claim 1 or 2, characterized in that
the second lip is formed at least partially by a second side portion (64) of the body member (50) and a third side portion (66) of the body member between the second side portion (64) of the body member (50) and the outer end (54) thereof, the semiconductive material (70) is disposed on the second side portion (64) of the body member (50).

4. The bell cup (22) of at least one of the preceding claims, characterized in that
the side portion (62, 64) of the body member has a generally cylindrical shape, the first side portion (62) of the body member has a diameter less than the second side portion (64) thereof.

5. The bell cup (22) of Claim 3 or 4, characterized in that
the third side portion (66) of the body member extends between the first and second side portions (62, 64) thereof.

6. The bell cup (22) of at least one of Claims 2 to 5, characterized in that
the diameter of the first side portion (62) of the body member (50) is generally conical and increases toward the outer end of the body member (50), the opening (56) of the body member (50) is generally conical.

7. The bell cup (22) of at least one of the preceding claims, characterized in that
the semiconductive member (70) is a semiconductive film applied to the second side portion (64) of the body member (50).

8. An electrostatic rotary atomizing device characterized by
comprising an electrostatic coating system rotary bell cup (22) according to at least one of claims 1 to 7.

9. The device of Claim 8, characterized in that
the third side portion (66) of the body member (50) is devoid of the semiconductive coating (70).

10. An electrostatic coating system that dispenses charged and atomized coating material from a rotary atomizing device, characterized in that
it comprises an electrostatic rotary atomizing device according to at least one of claims 8 or 9.

Patentansprüche

1. Rotierende Sprühglocke (22) eines elektrostatischen Beschichtungssystems, welche Folgendes umfasst:
in einem nicht leitendes Körperelement (50), welches ein inneres Ende (52), ein gegenüberliegendes äußeres Ende (54) und einen Seitenabschnitt (62, 64) aufweist;
eine Öffnung (56), welche im äußeren Ende des Körperelements gebildet ist;
ein Halbleiterelement (70), welches auf zumindest einem Abschnitt des Seitenabschnitts (64) des Körperelements (50) angeordnet ist;
gekennzeichnet durch
eine erste Kante, welche um die Öffnung (56) des Körperelements (50) nahe dessen äußerem Ende angeordnet ist,
wobei die erste Kante frei von dem Halbleiterelement (70) ist;
eine zweite Kante, welche zwischen der ersten Kante und dem inneren Ende (52) des Körperelements (50) angeordnet ist, wobei die zweite Kante radial nach außen von der ersten Kante angeordnet ist.

2. Sprühglocke (22) nach Anspruch 1, dadurch gekennzeichnet, dass
die erste Kante zumindest teilweise durch das äußere Ende (54) des Körperelements (50) und einen ersten Seitenabschnitt (62) dessen gebildet ist, wobei der ersten Seitenabschnitt (62) des Körperelements frei von dem Halbleiterelement (70) ist.

3. Sprühglocke (22) nach Anspruch 1 oder 2,
dadurch gekennzeichnet, dass
die zweite Kante zumindest teilweise durch einen zweiten Seitenabschnitt (64) des Körperelements (50) und einen dritten Seitenabschnitt (66) des Körperelements zwischen dem zweiten Seitenabschnitt (64) des Körperelements (50) und dem äußeren Ende (54) dessen gebildet ist, wobei das Halbleitematerial (70) auf dem zweiten Seitenabschnitt (64) des Körperelements (50) angeordnet ist.

4. Sprühglocke (22) nach mindestens einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, dass
der Seitenabschnitt (62, 64) des Körperelements eine im Allgemeinen zylindrische Form aufweist, wobei der erste Seitenabschnitt (62) des Körperelements einen Durchmesser aufweist, der kleiner ist als der zweite Seitenabschnitt (64) davon.

5. Sprühglocke (22) nach Anspruch 3 oder 4,
gekennzeichnet dadurch, dass
der dritte Seitenabschnitt (66) des Körperelements sich zwischen dessen erstem und zweitem Seitenabschnitt (62, 64) erstreckt.

6. Sprühglocke (22) nach mindestens einem der Ansprüche 2 bis 5,
dadurch gekennzeichnet, dass
der Durchmesser des ersten Seitenabschnitts (62) des Körperelements (50) im Allgemeinen konisch ist und zum äußeren Ende des Körperelements (50) hin zunimmt, wobei die Öffnung (56) des Körperelements (50) im Allgemeinen konisch ist.

7. Sprühglocke (22) nach mindestens einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, dass
das Halbleiterelement (70) eine Halbleiterschicht ist, welche auf den zweiten Seitenabschnitt (64) des Körperelements (50) aufgebracht wird.

8. Elektrostatische, rotierende Atomisiervorrichtung,
dadurch gekennzeichnet, dass
sie eine rotierende Sprühglocke (22) eines elektrostatischen Beschichtungssystems gemäß mindestens einem der Ansprüche 1 bis 7 umfasst.

9. Vorrichtung nach Anspruch 8,
dadurch gekennzeichnet, dass
der dritte Seitenabschnitt (66) des Körperelements (50) frei von der Halbleiterbeschichtung (70) ist.

10. Elektrostatisches Beschichtungssystem, welches
geladenes und atomisiertes Beschichtungsmaterial aus einer rotierenden Atomisiervorrichtung abgibt,
dadurch gekennzeichnet, dass
es eine elektrostatische, rotierende Atomisiervorrichtung gemäß mindestens einem der Ansprüche 8 oder 9 umfasst.

Revendications

1. Bol tournant (22) pour un système de revêtement électrostatique, comprenant:
- un élément de corps non conducteur (50) présentant une extrémité intérieure (52), une extrémité extérieure opposée (54), et une partie latérale (62, 64);
- une ouverture (56) formée dans l’extrémité extérieure de l’élément de corps;
- un élément semi-conducteur (70) disposé sur au moins une partie de la partie latérale (64) de l’élément de corps (50);
caractérisé par
- une première lèvre disposée autour de l’ouverture (56) de l’élément de corps (50) à proximité de l’extrémité extérieure de celui-ci;
- la première lèvre est dépourvue de l’élément semi-conducteur (70);
- une deuxième lèvre disposée entre la première lèvre et l’extrémité intérieure (52) de l’élément de corps (50), la deuxième lèvre étant disposée radialement à l’extérieur de la première lèvre.

2. Bol (22) selon la revendication 1, caractérisé en ce que la première lèvre est formée au moins en partie par l’extrémité extérieure (54) de l’élément de corps (50) et une première partie latérale (62) de celui-ci, la première partie latérale (62) de l’élément de corps étant dépourvue de l’élément semi-conducteur (70).

3. Bol (22) selon la revendication 1 ou 2, caractérisé en ce que la deuxième lèvre est formée au moins en partie par une deuxième partie latérale (64) de l’élément de corps (50) et une troisième partie latérale (66) de l’élément de corps entre la deuxième partie latérale (64) de l’élément de corps (50) et l’extrémité extérieure (54) de celui-ci, le matériau semi-conducteur (70) est disposé sur la deuxième partie latérale (64) de l’élément de corps (50).

4. Bol (22) selon au moins une des revendications précédentes, caractérisé en ce que la partie latérale (62, 64) de l’élément de corps a une forme généralement cylindrique, la première partie latérale (62) de l’élément de corps a un diamètre inférieur à celui de la deuxième partie latérale (64) de celui-ci.

5. Bol (22) selon la revendication 3 ou 4, caractérisé en ce que la troisième partie latérale (66) de l’élément de corps s’étend entre la première et la deuxième parties latérales (62, 64) de celui-ci.

6. Bol (22) selon au moins une des revendications 2 à
5. caractérisé en ce que le diamètre de la première partie latérale (62) de l’élément de corps (50) est généralement conique et augmente en direction de l’extrémité extérieure de l’élément de corps (50), l’ouverture (56) de l’élément de corps (50) est généralement conique.

7. Bol (22) selon au moins une des revendications précédentes, caractérisé en ce que l’élément semi-conducteur (70) est un film semi-conducteur appliqué sur la deuxième partie latérale (64) de l’élément de corps (50).

8. Dispositif de pulvérisation électrostatique tournant, caractérisé en ce qu’il comprend un bol tournant (22) pour un système de revêtement électrostatique selon au moins une des revendications 1 à 7.

9. Dispositif selon la revendication 8, caractérisé en ce que la troisième partie latérale (66) de l’élément de corps (50) est dépourvue du revêtement semi-conducteur (70).

10. Système de revêtement électrostatique qui distribue une matière de revêtement chargée et pulvérisée à partir d’un dispositif de pulvérisation tournant, caractérisé en ce qu’il comprend un dispositif de pulvérisation électrostatique tournant selon au moins une des revendications 8 ou 9.
REFERENCES CITED IN THE DESCRIPTION

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