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Parsons et al.

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[54] ELECTROSTATIC POWDER COATING APPARATUS

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[52] **U.S. Cl.** **239/15,** 317/3

[51] **Int. Cl.** **B05b 5/00**

[58] **Field of Search** 239/15, 3; 317/3

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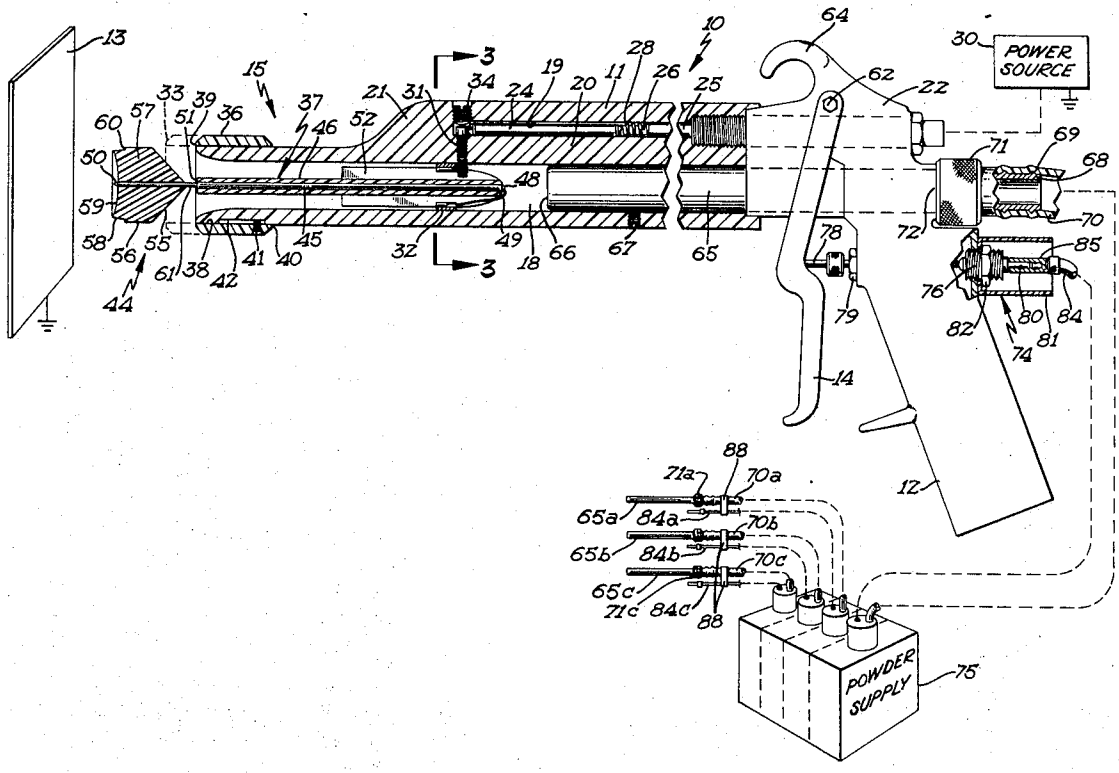
[57] **ABSTRACT**

An electrostatic powder coating apparatus for coating the surfaces of articles with pulverulent materials having a quick and efficient material change feature such that said apparatus is adapted for selectively spraying materials having different characteristics wherein the change from one material to another can be accomplished without extensive purging of the system, said apparatus including a spray gun, a powder supply means adapted to be removably connected to the inlet of said spray gun, and a control means adapted to be connected to a switching means on said gun for controlling the supply of pulverulent materials to said gun.

14 Claims, 5 Drawing Figures



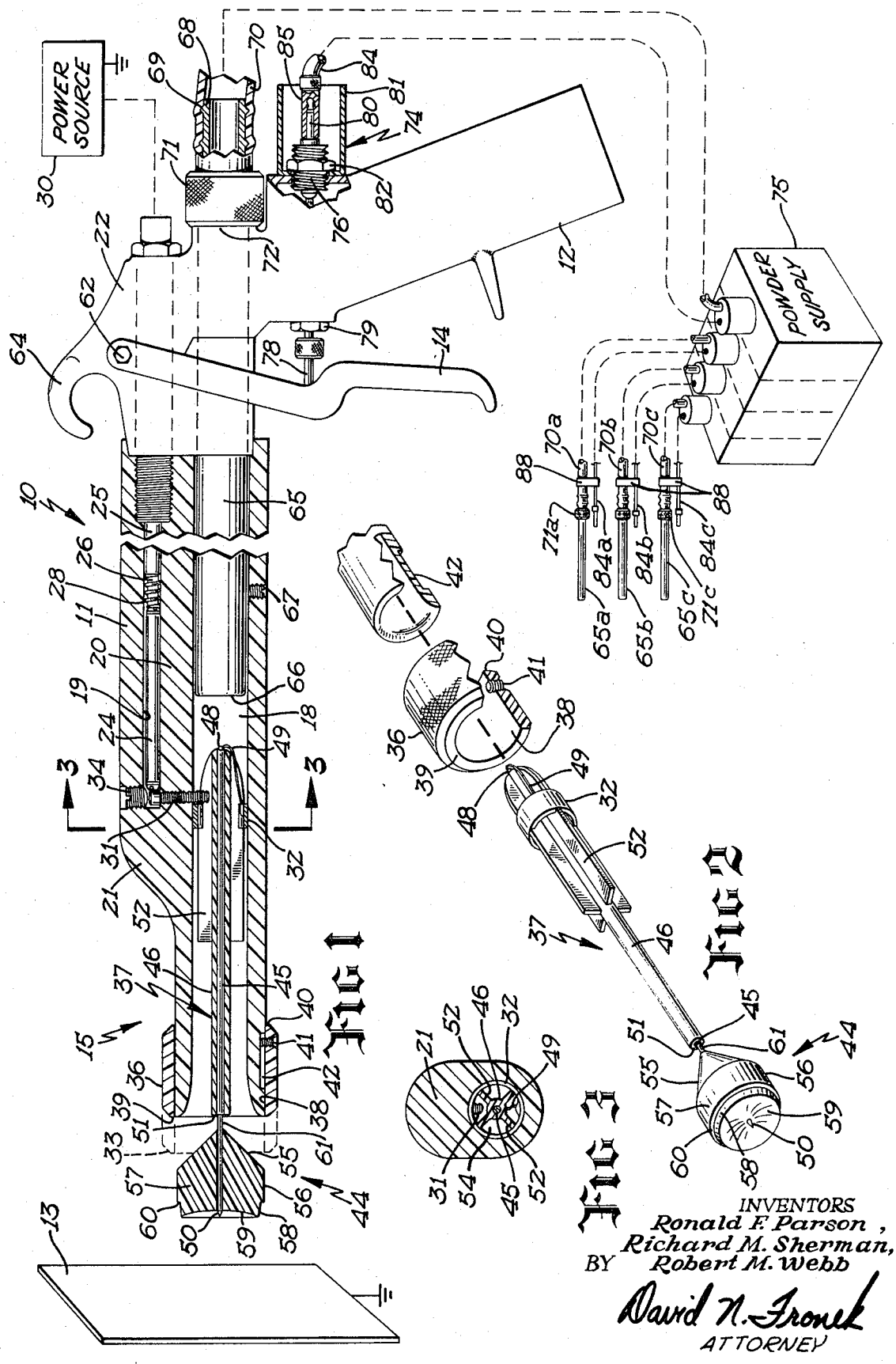


FIG 1

FIG 2

FIG 3

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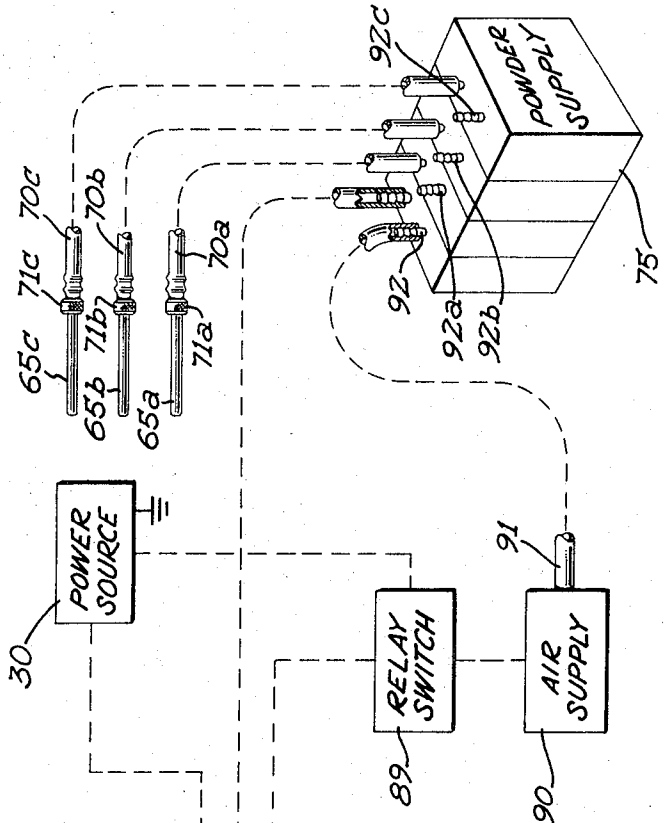

FIG 4

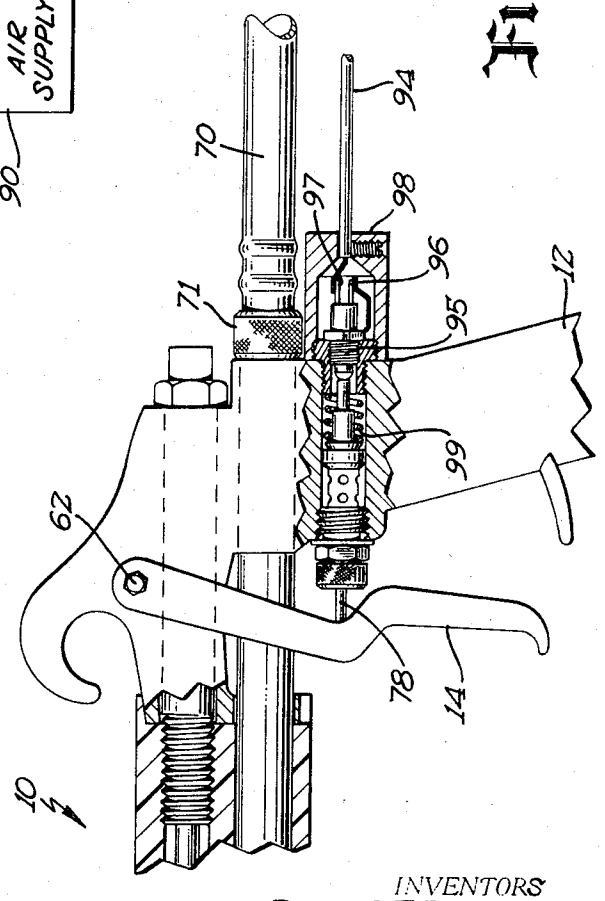

FIG 5

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ELECTROSTATIC POWDER COATING APPARATUS

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to an electrostatic spray gun for electrostatically coating pulverulent materials onto an article to be coated. More specifically, the present invention relates to an improved electrostatic powder coating apparatus having a material changing means by which the type of pulverulent materials sprayed from the gun can be easily and efficiently changed without the normal purging of the entire system.

One of the problems with both electrostatic liquid and powder coating apparatus of the past was the time consuming and inefficient process of changing the system from the spraying of a material having one characteristic to the spraying of a material having another. With respect to the electrostatic coating of powder materials, the present methods for changing a spray gun system from the spraying of one color to that of another involves the cleaning of the entire system by purging the powder line and the spray gun with an air flow through the supply line and the gun followed by an air blow-off. This procedure still was often not sufficient due to the very adherent nature of the powder being deposited.

In contrast to the electrostatic color coating guns of the past, the present invention provides an improved spray gun and an improved spray gun system in which the type of pulverulent material being sprayed can be easily and efficiently changed to another without the necessity of purging the entire system as in the past.

More specifically, the present invention includes a hand spray gun having an improved nozzle assembly including an ionization cone designed to be quickly and easily removed from the front portion of the spray gun to be cleaned when a color change is desired and then reinserted into the front portion of the gun. The specific structure on the ionization cone includes a probe extending from one end of the cone to the other, a cone body with a plurality of fins surrounding the rearward end of the probe for retaining the ionization cone within the spray gun, an ionization ring mounted on the fin portions for electrically connecting a high voltage source with the probe, and a conical deflector positioned at the forward end of the probe in a position such that a portion of the probe extends outwardly from an exterior surface of the conical member and such that the conical member is spaced from the cone body. When the high voltage source is actuated, the probe is elevated to a potential substantially greater than the potential of the article to be coated and an electrostatic field is set up between the article to be coated and each of the portion of the probe extending through the mechanical member and the portion of the probe located between the mechanical member and the cone body. It has been found that a structure of this sort affords the desired deposition and wrap-around of the pulverulent materials onto the article to be coated while requiring a much smaller voltage than spray guns of the past.

More specifically, the present invention provides for a quick and efficient material change system by which the spray gun can be selectively adapted for the spraying of several different type of pulverulent materials. The material change system includes, for each different material, a supply unit including a pair of members, one of which is adapted for conveying the pulverulent materials from the powder supply to the spray gun and the other of which is to transmit the "on-off" signal of the trigger movement of the gun to an appropriate relay switch for actuating both the high voltage power source and the powder supply system associated with the particular material to be sprayed. Additionally, the member conveying the pulverulent materials from the powder supply to the gun includes a relatively rigid tube designed to be inserted within the material passage of the gun and to extend substantially through the entire passage thereby minimizing the portion of the material passage and the supply line of the gun which has to be purged. Means is also provided for tightly securing the powder conveying member to the spray gun when that securement is desired.

Accordingly, it is an object of the present invention to provide an electrostatic powder coating apparatus having a quick and efficient material change means adapted for changing from a material having one characteristic to a material having a different characteristic without extensive purging of the system.

Another object of the present invention is to provide an electrostatic powder coating apparatus in which the charging and deflecting means is easily removed and cleaned when a material having a different characteristic is desired to be coated.

Another object of the present invention is to provide an electrostatic powder coating apparatus adapted for an efficient material change having a means associated with each different material for disposition within the material passage of the gun to thereby reduce the length of said passage which must be purged when a material change is effected.

A further object of the present invention is to provide an electrostatic powder coating apparatus in which a control means associated with each different material is adapted to be selectively connected with the spray gun for controlling the supply of that particular material from the powder supply to the spray gun.

These and other objects of the present invention will become apparent by referring to the preferred embodiment, the drawings, and the appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevated view partially in section showing the improved spray gun of the present invention.

FIG. 2 is a detailed exploded perspective view partially in section of the nozzle portion of the spray gun.

FIG. 3 is a sectional view of FIG. 1 as viewed from line 3—3.

FIG. 4 is a schematic representation of an electrostatic powder coating apparatus.

FIG. 5 is an elevated view partially in section of the control switch.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1 of the preferred embodiment, the electrostatic powder coating gun **10** of the present invention includes generally a barrel portion **11**, a nozzle portion **15** located near the front of the barrel portion **11**, a handle **12**, a trigger **14** and a means located near the rear portion of the gun **10** for supplying high voltage and pulverulent materials to the gun **10**.

More specifically, the barrel portion **11** of the gun **10** encloses a generally cylindrical material passage **18** extending longitudinally through the spray gun **10** and through the entire barrel portion **11**, and a generally cylindrical high voltage chamber **19** extending longitudinally through part of the barrel portion **11**. In the preferred embodiment, substantially all of the barrel portion **11**, and especially those portions of the barrel **11** which enclose the material passage **18** and high voltage chamber **19**, are constructed from a molded polyethylene which is electrically non-conductive.

The high voltage chamber **19** is separated from the material passage **18** by a molded polyethylene wall **20** and is disposed within the barrel **11** in a position which is substantially parallel to the passage **18**. The chamber **19** extends forwardly through the barrel **11** to a forward barrel portion **21** and rearwardly through the barrel **11** to and through a metal rear portion of the gun **22**. At its front end, the chamber **19** houses a 150-megohm resistor **24**, the rear end of which is electrically connected to a high voltage cable **25** housed in the rearward portion of the chamber **19**. The resistor **24** and the cable **25** are electrically connected by a stress relief cap **26** which includes a compression spring **28** biasing the resistor **24** toward the forward end of the chamber **19**. The rearward portion of the high voltage cable **25** is electrically connected by an appropriate fitting to the ungrounded terminal of a high voltage source indicated schematically by the reference numeral **30**. The other terminal of the high voltage source **30** is electrically grounded.

Located in the forward portion of the chamber **19** is an electrically conductive set screw **31** threadedly extending through the wall **20** to thereby electrically connect the resistor **24** with a contact or ring member **32** disposed within the material passage **18** and which will be more fully described below. Directly above the set screw **31** is a plug **34** which is threadedly received by a portion of the barrel and which can readily be removed for adjustment or removal of the set screw **31**.

The nozzle portion **15** located near the forward end of the barrel **11** generally includes a pattern control sleeve or cylindrical member **36** telescopically mounted over a portion of the forward end of the barrel **11** and adapted for axially sliding movement along the forward portion of the barrel **11**. The sleeve **36**, constructed of an electrically non-conductive material such as a linear synthetic polyamide, commonly sold under the trademark Nylon, includes a relatively cylindrical interior surface **38** substantially conforming in diameter to the exterior surface of the forward end of the barrel **11**, a forward end portion **39** which, when the sleeve **36** is moved to an extended position, is disposed at a position spaced forwardly from the forward end of the passage **18**, a rearward end portion **40**, and a set screw **41** extending through the body of the sleeve **36** for a limited distance to engage the longitudinal channel **42** which is formed in a portion of the exterior surface of the barrel **11**. As shown by the broken line **33**, the sleeve **36** can be moved to a plurality of extended positions in which the forward end **39** is forwardly spaced from the forward end of the passage **18**. When in a retracted position, the forward end **39** does not extend forward of the forward end of said passage **18**. When the screw **41** engages the channel **42**, the axial movement of the sleeve **36** is limited as a result of the screw **41** engaging the shoulder portions of the channel **42**. In this manner, the sleeve **36** cannot inadvertently be moved to an extent that the sleeve is removed from the barrel **11**. Also, the screw **41** can be tightened against the inner surface of the channel **42** when the sleeve **36** is in a desired position to thereby retain the sleeve **36** in that position.

As also shown in FIG. **1**, the forwardmost interior surface of the passage **18** is curved or flared outwardly. This flaring, in combination with the axially movable sleeve **36** and the deflecting member **44**, which will be described in more detail below, causes the pulverulent materials passing through the passage **18** to be formed into a desired spray pattern.

Referring now to FIG. **2**, an elongated ionization member **37** disposed within the passage **18** includes a probe or electrode **45**, a deflecting member **44**, a body member **46** and a ring member **32**. The probe **45** extends the entire length of the ionization member **37**. At its rearward end **48**, the probe **45** is electrically connected to the ring member **32** by a conducting wire **49**. At its forwardmost end, the probe **45** passes through the deflecting member **44** and extends past the concave surface **59** of the deflector **44**. The portion of the probe **45** extending past the surface **59** serves as an ionization point or needle **50** causing an electrostatic field to be set up between the point **50** and the article to be coated **13** when the point **50** and the article **13** are maintained at substantially different electrical potentials.

The generally cylindrical body member **46** surrounds a substantial portion of the probe **45** and extends from the rearward end **48** of the probe **45** to a point **51** near the forward end of the probe **45**. In the preferred embodiment, the location of the point **51** is substantially even with the forward end of the passage **18** when the member **37** is operatively disposed within the passage **18**.

A plurality of fins **52** integrally formed with the rearward portion of the body member **46** are spaced about the circumference of the member **46** and extend upwardly therefrom such that the diameter of the exterior fin surfaces is slightly larger than the interior diameter of the material passage **18** so that the ionization member **37** may be retained within the passage **18**. As better seen in FIG. **3**, the plurality of fins **52** are equally spaced about the circumference of the body member **46** and extend radially outwardly therefrom.

Referring now to both FIGS. **2** and **3**, a ring member **32** is mounted to a portion of the fins **52** at a position which is spaced forwardly from the rearward end **48** of the probe. Referring specifically to FIG. **3**, the mounting of the ring in this manner provides a plurality of passages **54** through which the pulverulent materials may pass as they are conveyed through the passage **18**.

The ring member **32** is constructed of an electrically conductive material and is electrically connected to the resistor **24** (FIG. **1**) by the set screw **31**. When the ionization member **37** is inserted into the forward end of the passage **18**, the ring **32** engages the set screw **31**, thereby electrically connecting the ring **32** with the screw **31**, and also preventing further inward movement of the ionization member **37**. The member **37** is then retained in this position by the plurality of fins **52** which are force fitted against the interior surface of the passage **18**. Because the member **37** is secured within the passage **18** due to the flexible and somewhat resilient nature of the fins **52**, the member **37** can easily be removed, cleaned and replaced when such cleaning is desired. This is often the case when the gun or the system is changed from spraying a pulverulent material having one characteristic to a pulverulent material having another.

The deflecting member **44** through which the forward portion of the probe **45** passes is generally conical in shape and includes a cylindrical surface **56**, a tapered or conical surface **55** extending from the surface **56** and tapered inwardly toward the body member **46**, a tapered surface **58** extending from a cylindrical portion **57** of the member **44** inwardly away from the body member **46**, a shoulder portion **60** connecting the surface **56** with the surface **58**, and a concave surface **59** which is perpendicular to the longitudinal axis of the probe **45** and which is the forwardmost surface of the deflector **44**. The body member **46**, the fins **52** and the deflecting member **44** are all constructed of non-conductive material such as a linear synthetic polyamide commonly sold under the trademark Nylon.

As best shown in FIG. **2**, the tapered surface **55** tapers inwardly toward the body member **46** and terminates at a point which is spaced from the forwardmost point **51** of the body **46**. This provides for a portion **61** of the electrically conductive probe **45** to be directly exposed to the pulverulent materials being discharged from the end of the material passage **18**. It is believed that an electrostatic field is set up between the portion **61** and the grounded article **13** to thereby supercharge or precharge the pulverulent materials being emitted from the passage **18**, thereby causing greater wrap-around and better deposition of the particles onto the article **13** with a substantially lower voltage.

As shown in FIG. **2**, the forwardmost portion of the probe **45**, the ionization point **50**, extends for a distance past the concave surface **59**. A difference in electrical potential between the point **50** and the article **13** causes an electrostatic field to be formed between the point **50** and the grounded article **13** to thereby additionally charge the pulverulent materials emitted from the material passage **18** and direct those charged particles toward and onto the article **13**. It should be noted that in the preferred embodiment the forwardmost point of the needle **50** does not extend past the edge formed between the tapered surface **58** and the concave surface **59**, but rather is shielded within the concave portion formed by the surface **59**. This shielding prevents pulverulent materials which have been precharged by the portion **61** from being repelled by the needle **50** which contains charges of identical polarity to the charges then carried by the pulverulent particles and also limits undesired contact with the point **50**. It is believed that this shielding results in a more efficient system which can provide the same wrap-around and same deposition with a much lower voltage.

Referring again to FIG. **1**, the rearward portion of the gun **10** of the present invention can be seen as including a metal portion **22**, a handle **12** extending downwardly from the rear portion **22**, a trigger **14** pivotally connected to the gun at the

pivot **62**, and a hook **64** by which the gun **10** can be hung when it is not in use. Extending through the material passage **18** is a relatively rigid, electrically non-conductive tube **65** for conveying pulverulent materials through the passage **18**. As shown in the preferred embodiment, the tube **65** extends through a substantial portion of the passage **18** with its forward end **66** terminating at a point which is spaced rearwardly of the set screw **31**. The rearward end **68** of the tube **65** includes a portion containing a plurality of circumferential ribs **69** which are adapted for attachment of the end **68** to a flexible tube **70** of the type normally used for transporting pulverulent materials in an electrostatic spraying system.

The tube **65**, although relatively rigid when compared to the hose **70**, is not so rigid that it cannot be bent slightly, and is generally cylindrical having an external diameter slightly smaller than the internal diameter of the material passage **18**. With this construction, the tube **65**, with the flexible hose **70** attached to its rearward end, can be easily inserted into and removed from the material passage **18** when such insertion or removal is desired. When the tube **65** has been inserted into the passage **18**, it is held tightly in place by the fitting **71** which contains internal threads for engagement with a corresponding externally threaded member **72** integrally formed with the gun body **10**. A set screw **67** may also be contained in the gun wall and adapted to aid in retaining the tube **65** within the passage **18**.

The specific structure of the embodiment shown in FIG. **1**, due to the fact that the tube **65** and hose **70** are easily and quickly removable from the gun, allows several such tubes and hoses, each associated with a pulverulent material with a different characteristic, to be selectively used with the gun. This permits the spray gun of the present invention to be changed from the spraying of a pulverulent material having one characteristic to the spraying of a pulverulent material having another with little inconvenience to the operator. This feature will be discussed in more detail below.

Also shown in FIG. **1** is the means **74** for selectively actuating both the powder supply **75**, which includes a plurality of powder supply units, and the high voltage source **30**. This means includes an "on-off" control switch **76** which, when in the "on" position, electrically connects a ground terminal with a male jack **80**. This ground terminal (not shown) enters the gun together with the high voltage cable. When the switch is in the "off" position, the aforementioned ground terminal and the male jack **80** are not electrically connected. The control switch **76**, in turn, is controlled by movement of the trigger **14** toward or away from the handle **12** respectively. When the trigger **14** is moved toward the handle **12**, a spring-loaded shaft **78** is moved inwardly, thereby turning the control switch **76** to an "on" position and connecting the male jack **80** with the grounded terminal. When the trigger **14** is released, the spring-loaded shaft **78** moves away from the handle **12**, thereby turning the control switch to an "off" position and disconnecting the male jack **80** from the grounded terminal. The shaft **78** is centered and retained in the gun handle **12** by the fitting **79**.

The switch **76** is secured to the gun handle **12** by the jam nut **82**. A cylindrical sleeve member **81**, which is integrally formed with the gun handle **12** surrounds the jack **80** and a portion of the switch **76** to shield the jack **80** from any sudden jar which could be caused, for example, by dropping the gun. Also shown in FIG. **1** is a cord **84** containing a single conducting wire and having one end which includes a female jack **85** adapted to engage and connect with the male jack **80**. When the female jack **85** and the male jack **80** are engaged, the wire within the cord **84** and the grounded terminal (not shown) are electrically connected. The female jack **85** is retained in engagement with the male jack **80** by the resilient nature of the female jack **85**. Although it is specifically shown in FIG. **1**, the cord **84** extends from the male jack **80** to a relay switch contained in the powder supply **75**, which, when energized, actuates both the powder supply **75** and the high voltage source **30**.

The preferred embodiment further includes a supply unit having a plurality of flexible hoses **70** (*a* – *c*) and a plurality of cords **84** (*a* – *c*) associated respectively with each of the hoses **70** (*a* – *c*). All of the hoses **70** (*a* – *c*) and the cords **84** (*a* – *c*) have one end connected with a powder supply means **75** and the other end adapted for selective engagement with the material passage **18** and the male jack **80** respectively by appropriate connections. In this respect, each of hoses **70** (*a* – *c*) includes a fitting **71** (*a* – *c*) respectively corresponding to the fitting **71** for engagement with the threaded member **72**, and a relatively rigid tube **65** (*a* – *c*) respectively corresponding to the tube **65** for insertion into the chamber **18**. Also, each of the cords **84** (*a* – *c*) includes a female jack corresponding to the female jack **85** adapted to engage the male jack **80**. Each of the tubes **70** (*a* – *c*) are held to the corresponding cord **84** (*a* – *c*) respectively by a clamp **88** so that corresponding pairs of hoses **70** (*a* – *c*) and cords **84** (*a* – *c*) will be connected with the gun **10** together.

Each of the pairs of hoses **70** (*a* – *c*) and cords **84** (*a* – *c*) is associated with a pulverulent material having a different characteristic which can be selectively engaged with the gun **10** when a material with a particular characteristic is desired. For example, the hose **70***a*, the tube **65***a* and the cord **84***a* are all associated with a material having a certain characteristic and when it is desired to coat this particular material onto the article **13**, the tube **65***a* with the hose **70***a* attached is inserted into the material passage **18** and the fitting **71***a* is tightened over the fitting **72**. Likewise, the cord **84***a* is connected with the male jack **80**. When a material having a different characteristic is desired to be coated onto the article, the tube **65***a*, the hose **70***a* and cord **84***a* are removed, and the hose, tube and cord associated with that different material are connected with the material passage **18** and the male jack **80** in a similar manner. Although the pulverulent materials with different characteristics commonly would be materials having different colors, the different characteristics could be differences in materials also such as vinyl, polyester, or cellulose-acetate-butyrate.

Each of the cords **84** (*a* – *c*) shown in FIG. **1** like the cord **84**, is electrically connected to a relay switch which, when energized, actuates the high voltage source **30** and that portion of the powder supply **75** with which the cord **84** (*a* – *c*) is associated. For example, if the hose **70***a* and the cord **84***a* are each associated with certain pulverulent material and each are connected to the gun **10** as above described, depression of the trigger **14** will cause the circuit to be completed between the grounded terminal and the conducting wire within the cord **84***a* to energize a relay switch. When this relay switch is energized, the high voltage source **30** and that portion of the powder supply **75** associated with the cord **84***a* and hose **70***a* is actuated. When the trigger **14** is released, the circuit between the grounded terminal and the wire within the cord **84***a* is open and the relay switch is deenergized, thereby turning off the power source **30** and the powder supply **75**.

When a material having a different characteristic is desired to be coated onto the article **13**, the hose **70***a* and the cord **84***a* are disengaged from the gun **10**, the ionization member **37** taken out and cleaned by compressed air and then replaced, and one of the other hoses **70** (*b*, *c*) and cords **84** (*b*, *c*) associated with a material having the desired characteristic are connected to the gun **10**.

An alternative embodiment of the powder coating apparatus of the present invention is shown in FIG. **4**. In FIG. **4**, reference numerals similar to those in FIG. **1** correspond to components which are identical to those of FIG. **1**. FIG. **4** is a schematic representation showing the spray gun **10**, the power source **30** for supply a high voltage to the ionization member of the gun, and a powder supply **75** for supplying pulverulent material to the gun **10**. This alternative embodiment includes a relay switch **89**, which when energized actuated both the power source **30** and an air supply **90**. The air supply **90** includes a flexible air hose **91** which is adapted to be removably connected to one of a plurality of ribbed air inlet tubes **92** and

92 (*a* – *c*). The hoses 70 and 70 (*a* – *c*) are adapted for removable connection to the gun 10 for supplying powder thereto.

As shown in FIG. 5, the switch 95 includes a pair of terminals 96 and 97. One of the terminals 96 is electrically connected to a grounded terminal while the other 97 is electrically connected to the cord 94. The switch 95 is controlled by the movement of the trigger 14 and the spring mounted shaft 78 which is biased forwardly by the compression spring 99. When the trigger 14 is depressed, the switch 95 is turned to an "on" position thereby electrically connecting the cord 94 with the terminal 96 and thereby the grounded terminal (not shown). When the trigger 14 is released, the switch is in an "off" position and the cord 94 and the grounded terminal are not electrically connected. A cylindrical member 98 surrounds the terminals 96 and 97 to prevent undesired contact with the terminals.

Referring again to FIG. 4, when the trigger 14 is depressed, a signal is transmitted from the gun 10 to the relay switch 89 via the cord 94. This signal energizes both the power source 30 and the air supply 90. When the trigger 14 is released, the relay switch 89 is deenergized thereby turning off the power source 30 and the air supply 90.

When a material having a different characteristic is desired to be sprayed, the hose 70 is removed from the gun 10 and the hose 91 removed from the air inlet tube 92. Then, the hose 70 (*a* – *c*) associated with the material having the desired characteristic is connected to the gun 10 and the hose 91 is connected to the corresponding air inlet 92 (*a* – *c*).

Although the description of the present invention has been quite specific, it is understood by the application that there may be many alternative embodiments of the present invention which can be constructed without deviating from the spirit of the invention. Consequently, the scope of the present invention should be dictated by the appended claims rather than by the description of the preferred embodiment.

We claim:

1. An electrostatic powder coating apparatus for selectively electrostatically coating the surfaces of articles with pulverulent materials having a desired particular characteristic comprising:

an electrostatic powder coating spray gun having a gun body containing a passage, said passage having an inlet for receiving pulverulent materials and a discharge for discharging said pulverulent materials toward the article to be coated, said spray gun further having

a powder supply connecting means for connecting a powder supply conduit with the inlet of said passage,

a switch means including a second connecting means for the connection of a control wire,

a powder supply conduit adapted for removable connection to said powder supply connecting means and adapted to supply pulverulent material having a particular desired characteristic to the inlet of said passage, and

a control means for controlling the supply of said pulverulent material to the inlet of said passage including a control wire whereby said switch means controls the supply of pulverulent materials having the desired particular characteristic to the inlet of said passage.

2. The electrostatic powder coating apparatus of claim 1 wherein said passage is a longitudinal passage.

3. The electrostatic powder coating apparatus of claim 1 having a plurality of powder supply units each having a powder supply conduit adapted for removable connection to said powder supply connecting means and adapted to supply pulverulent material having a particular characteristic to said passage, each of said powder supply units also having an air supply connection means for selective connection with an air supply.

4. The electrostatic powder coating apparatus of claim 2 wherein said supply conduit includes a relatively rigid tube portion adapted to be disposed within said longitudinal passage.

5. The electrostatic powder coating apparatus of claim 3 wherein said supply conduit includes a rigid tube portion adapted to be inserted into the inlet of said longitudinal passage and extend through said longitudinal passage to a point immediately to the rear of said elongated charging and deflecting means.

6. The electrostatic powder coating apparatus of claim 1 wherein said switch means includes a trigger pivotally secured to said spray gun and wherein said second connecting means includes a male jack.

7. The electrostatic powder coating apparatus of claim 6 having a rigid sleeve means surrounding said male jack for preventing undesired contact with said male jack.

8. The electrostatic powder coating apparatus of claim 1 wherein said switch means is an electrical switch means and wherein said control wire is an electrical control wire.

9. The electrostatic powder coating apparatus of claim 1 having a plurality of powder supply units each having a powder supply conduit adapted for removable connection to said powder supply connecting means and adapted to supply pulverulent material having a particular desired characteristic to said passage, each of said powder supply units also having a control means for controlling the supply of pulverulent material to said passage including a control wire adapted for removable connection to said second connecting means.

10. The electrostatic powder coating apparatus of claim 9 wherein each of said powder supply conduits includes a relatively rigid tube portion adapted to be disposed within said passage.

11. The electrostatic powder coating system of claim 9 wherein said switch means is an electrical switch means and wherein said control wire is an electrical control wire.

12. The electrostatic powder coating apparatus of claim 9 having means for connecting the supply conduit and control means of each supply unit such that when one of said supply conduits is connected to said powder supply connecting means, its respective control wire will be connected to said second connecting means.

13. The electrostatic powder coating apparatus of claim 12 wherein each of said powder supply conduits includes a relatively rigid tube portion adapted to be disposed within said passage and wherein said switch means is an electrical switch means and wherein said control wire is an electrical control wire.

14. The electrostatic powder coating apparatus of claim 13 having a means including a threaded fixture for rigidly securing said powder supply conduit to said gun.

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