Sept. 17, 1963 H. J. REINDL ETAL 3,104,185

CENTRIFUGAL DISTRIBUTOR AND ELECTROSTATIC PAINTING APPARATUS EMPLOYING SAME

Filed Nov. 15, 1961 2 Sheets-Sheet 1

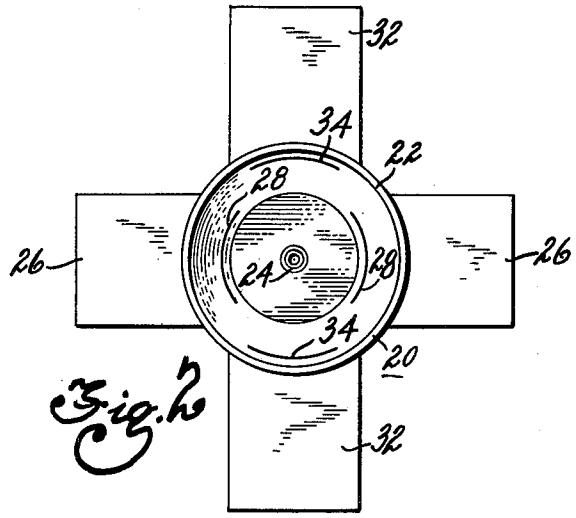


Fig. 2

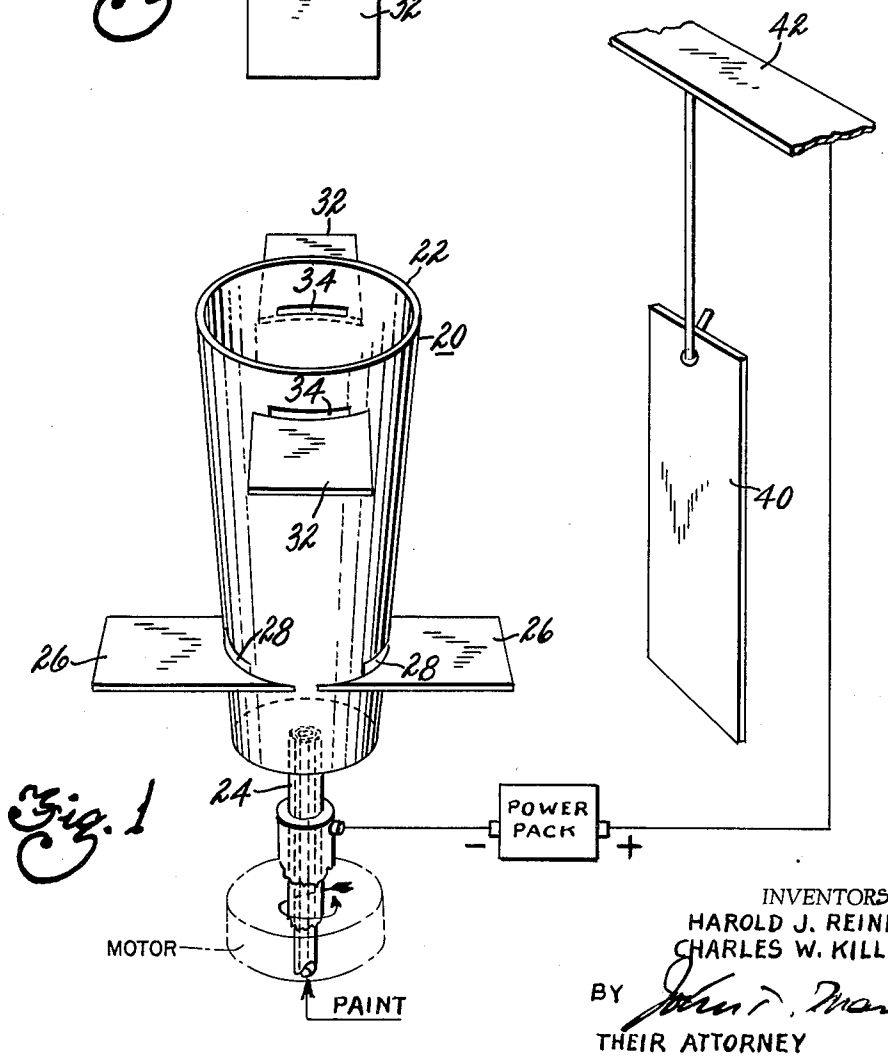


Fig. 1

INVENTORS
HAROLD J. REINDL
CHARLES W. KILLEN
BY
THEIR ATTORNEY

Sept. 17, 1963 H. J. REINDL ETAL 3,104,185

CENTRIFUGAL DISTRIBUTOR AND ELECTROSTATIC PAINTING APPARATUS EMPLOYING SAME

Filed Nov. 15, 1961 2 Sheets-Sheet 2

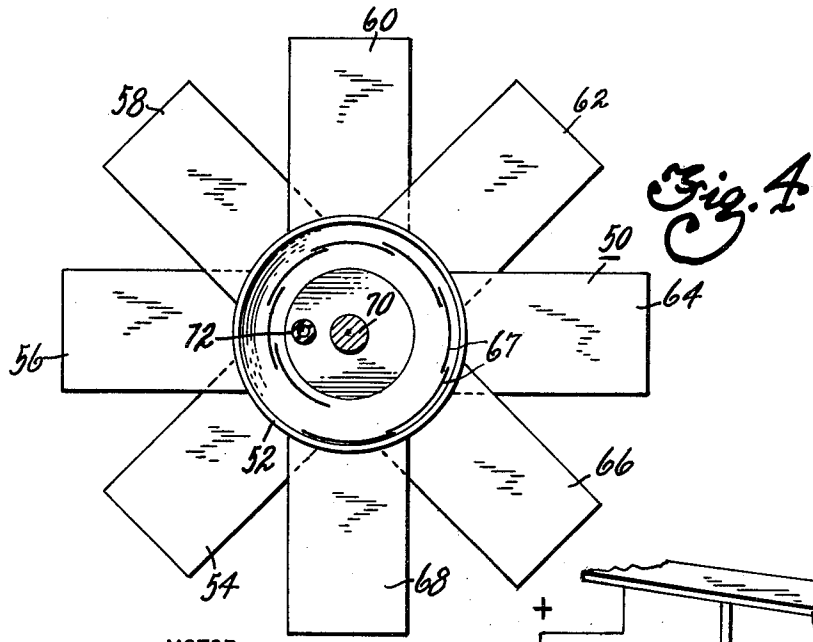


Fig. 4

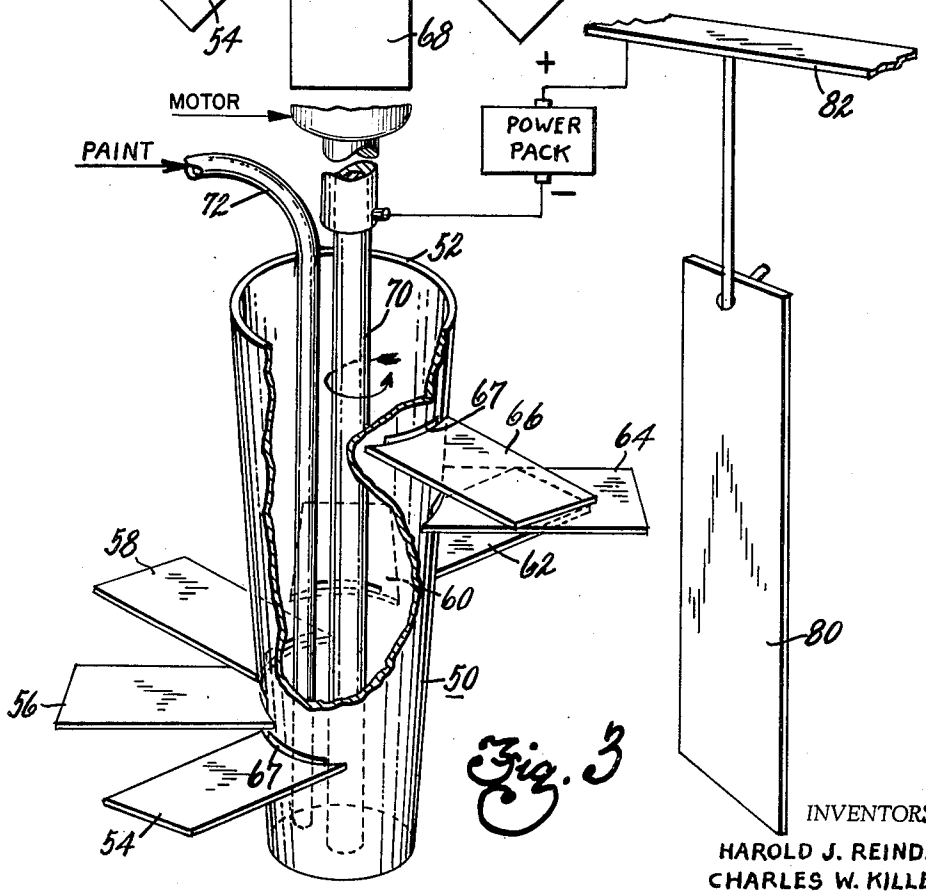


Fig. 3

INVENTORS
HAROLD J. REINDL
CHARLES W. KILLEN
BY
THEIR ATTORNEY

United States Patent Office 3,104,185 Patented Sept. 17, 1963

3,104,185

CENTRIFUGAL DISTRIBUTOR AND ELECTROSTATIC PAINTING APPARATUS EMPLOYING SAME

Harold J. Reindl, Dayton, and Charles W. Killen, Piqua, Ohio, assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Nov. 15, 1961, Ser. No. 152,555
5 Claims. (Cl. 118—627)

This invention relates to electrostatic painting methods and apparatus and is particularly concerned with electrostatic painting operations wherein the width of the pattern of paint deposited is predetermined.

It is, therefore, an object of this invention to provide a method and apparatus for distributing paint and other coating material for electrostatic deposition wherein the width of the pattern of paint is predetermined at the source.

Carrying out this object, it is a further object of this invention to utilize dual distributors with a single paint spray wherein the distributors are in different planes and are disposed so as not to oppose each other electrostatically whereby the width of the pattern distributed thereby is predetermined and controlled.

In carrying out the above object, it is a further object to utilize a centrifugal distributor whereby the paint is distributed in a circular pattern of expanding diameter.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIG. 1 is a view in perspective of one type of paint distributor diagrammatically shown with respect to an article to be painted.

FIG. 2 is the top section of the distributor shown in FIG. 1.

FIG. 3 is a view in perspective showing another type of distributor diagrammatically depicted with an article to be painted and FIG. 4 is the top section of the distributor in FIG. 3.

Centrifugal electrostatic paint distributors are not new. In Patent 2,975,755 various forms of blade-like distributors are shown wherein paint mixed with a solvent is supplied to a central cup and is centrifugally distributed by the blade in an expanding circular pattern. Another type of distributor for painting operations is shown in Patent 2,776,175. In this instance a squirrel cage blower is used as the means for distributing the paint outwardly in an expanding circular pattern. In all of these devices the paint which is supplied to the distributor is premixed with a solvent and is thrown from the distributor in a plane the width of which may be varied by turning up the ends of the blade or by using a wider rotor, etc. In no case, however, is it feasible to produce a pattern of any great width which necessitates the reciprocation of the entire device in a vertical direction to move the device a predetermined distance whereby the ultimate width of the pattern is controlled and is of substantial extent.

The reciprocating apparatus is not only costly but it creates difficulties with respect to the paint supply, etc., and requires service and attendant expense. The present invention is specifically directed to a distributor and method for using same wherein the width of pattern may be predetermined and wherein the distributor remains in one position and is not required to reciprocate during its use. This facilitates paint connections thereto and

eliminates many of the problems heretofore present in apparatus of this type.

Referring to the drawings, FIG. 1 shows one embodiment of my invention wherein a paint distributor 20 is shown which comprises a central cup-like paint supply member 22. The member 22 is mounted on a hollow shaft 24 that is driven by a motor, not shown. The interior of the hollow shaft is connected to a paint supply, not shown, so that liquid may be fed through the shaft and into the member 22 at the bottom thereof. Two blade-like members 26 are provided at opposite sides of the member 22 adjacent the lower end thereof and slots 28 are provided in the wall of the member 22 in alignment with the blades 26. Toward the top of the cup member 22 another pair of blades 32 are provided extending from opposite sides of the member 22 and a pair of slots 34 are provided to connect the surface of the blades 32 with the interior of the cup. When the entire assembly 20 is rotated at speeds ranging from 900 to 3500 r.p.m., for example, and paint is supplied to the interior of the cup through the shaft 24, the paint is centrifugally fed to the vertical walls of the cup and flows upwardly due to centrifugal action until it reaches the first set of apertures or slots 28, whence a portion thereof is fed to the surface of the blades 26. The remainder of the paint continues to move upwardly to the slots 34 whence it passes out to the surface of blades 32. As the paint moves along the surface of the blades 26 and 32 it is thrown vertically thereof in two generally circular expanding patterns. The width of the overall pattern from the distributor 20 is at least equal to the distance between the blades 26 and 32 plus the general expansion of the pattern downwardly and upwardly in accordance to the distance of an article to be painted thereby. In this respect, an article in the form of a plate is shown at 40. This article is hung on a carrier 42 which preferably moves the article around the distributor 20. Of course, a number of articles may be mounted on the carrier 42 in spaced relation.

In order to take advantage of the electrostatic forces, a power pack operating at voltages in the order of 20,000 to 120,000 volts is connected at one pole thereof to the shaft 24 and the distributor 20 and at the other pole thereof to the carrier 42 which is in turn connected to the article 40. In this manner paint particles are dispersed from the blades 26 and 32 and are charged with a negative charge while the article 42 carries the positive charge. This electrical condition causes the particles to be attracted to the article whereby a better paint deposition is obtained.

In the instant case it is unnecessary to vertically reciprocate the distributor 20 since the width of pattern may be predetermined by the space between the blades 26 and 32 whereby this spacing is calculated to completely envelope the extent of the article 40.

Another type of distributor 50 is shown in FIGS. 3 and 4. In this instance a central cup 52 is utilized which is of considerable vertical extent. Around the cup 52 are mounted single blades 54, 56, 58, 60, 62, 64, 66 and 68. These blades are oriented radially in a step-wise fashion around the cup 52 and each blade is positioned above the previous blade whereby the blades emanate all around the cup as shown in the top view of FIG. 4. Each blade is connected to the interior of the cup by a slot 67. The cup 52 is mounted on a central shaft 70 which is rotated by a motor not shown and paint is supplied to the cup from a paint source through a stationary tube 72. As the cup is rotated and paint is supplied thereto the paint is caused to travel upwardly in a film on the interior of the cup due to the centrifugal forces and is thereby supplied progressively to the several blades

through their respective slots **67**. In this manner a substantial width of pattern is obtained.

An article to be painted **80** is carried on a carrier **82** and may be one of a number of similar articles on the carrier. The carrier and article are connected to one pole of the power pack while the other pole of the pack is connected to the distributor **50**, for example, through its drive shaft. During rotation, particles of paint are centrifugally thrown from the ends of the several blades and these particles carry a negative charge, and are attracted electrostatically to the article **80** which carries the opposite or positive charge. Due to the fact that the blades are spaced from one another longitudinally the width of paint may be predetermined so that the article **80** may be painted in its entirety without reciprocation of the distributor **50**.

It is apparent that various other physical embodiments of the invention may be used. The shape of the blades may be varied, they may be twisted at their ends or cupped, etc., as desired. In any event, and in every instance, it is desirable that the blades are not positioned directly above one another so that the electrostatic fields thereof oppose one another. This tends to reduce the electrostatic effect. By placing the blades in staggered relation, the repelling effect of electrostatic charges is minimized and the electrostatic forces exert their greatest efforts to cause deposition of the paint or other coating material onto the article.

In some cases, the several apertures may include adjustable gates so that the area thereof may be varied to produce uniform or non-uniform density of paint from bottom to top. Of course, after determining the desired areas for a given set up, fixed apertures may be used.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. Painting apparatus comprising in combination an elongated vertically positioned central cup member, a plurality of blades carried by said member and spaced axially and out of vertical register with one another throughout the vertical extent of said cup, said cup including openings in the vertical wall thereof adjacent the base of each blade, paint supply means for supplying paint to the cup, and drive means for rotating the cup whereby paint supplied thereto is centrifugally distributed upwardly in the cup and through the several openings onto the blades for centrifugal distribution therefrom in a circular pattern having a depth at least equal to the axial distance between the top and bottom blades.

2. A centrifugal distributor for distributing a coating material in a circular pattern of expanding extent and of predetermined depth, comprising a cup-like member having a vertically-disposed axis, means for supplying liquid coating material to said cup-like member, a plurality of blade-like members extending outwardly therefrom and spaced apart vertically, said cup-like member including openings in the vertical wall thereof adjacent the upper surface of each of said blades, and means for rotating the cup-like member and the said blade-like members at a speed sufficient to cause said coating material in said cup-like member to move upwardly over the internal vertical wall thereof and to flow outwardly of said openings onto the surfaces of said blade-like members, whereby said coating material is dispersed and is thrown centrifugally from said blade-like members in a circular pattern of expanding extent and having a depth at least equal to the vertical spacing between said blade-like members.

3. The distributor claimed in claim 2 wherein the blade-like members are spaced radially from one another.

4. The distributor claimed in claim 2 wherein the cup-like member is carried by a vertical shaft.

5. Electrostatic painting apparatus comprising in combination an elongated vertically positioned central cup member, a plurality of blades carried by said member and spaced axially and out of vertical register with one another throughout the vertical extent of said cup, said cup including openings in the vertical wall thereof adjacent the base of each blade, paint supply means for supplying paint to the cup, and drive means for rotating the cup whereby paint supplied thereto is centrifugally distributed upwardly in the cup and through the several openings onto the blades for centrifugal distribution therefrom in a circular pattern having a depth at least equal to the axial distance between the top and bottom blades and an electrostatic power pack one pole of which is connected to said painting apparatus with the other pole being connected to an article to be painted which is spaced from the distributor whereby the centrifugally distributed paint is electrostatically charged and is attracted to the article to be painted.

References Cited in the file of this patent

UNITED STATES PATENTS

2,157,416	Kjos	May 9, 1939
2,766,071	Flury	Oct. 9, 1956
3,039,890	Reindl	June 19, 1962