

[54] APPARATUS FOR SPRAYING
CLYINDRICAL ARTICLES

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[51] Int. Cl. B05c 5/00

[58] Field of Search 118/322, 314, 2, 320

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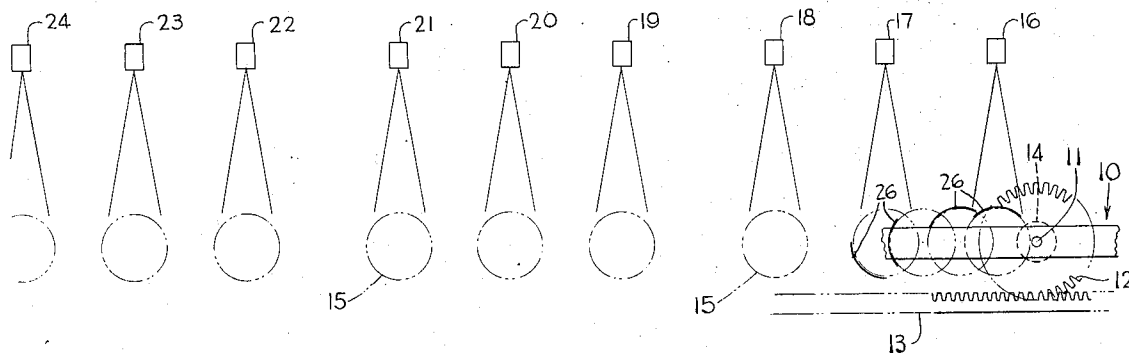
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[57] ABSTRACT

Apparatus for spray coating bottles by moving the bottles linearly and simultaneously rotating them at a rate synchronized with their linear movement. A series of spray guns are spaced alongside the path of the bottles at the side where their peripheries are rotating forwardly. The rotation of the bottles is so related to their linear movement and to the spacing of the spray guns that the points on the bottles which register with the spray guns as the bottles move rotatively along are uniformly spaced about the bottle peripheries.

3 Claims, 2 Drawing Figures



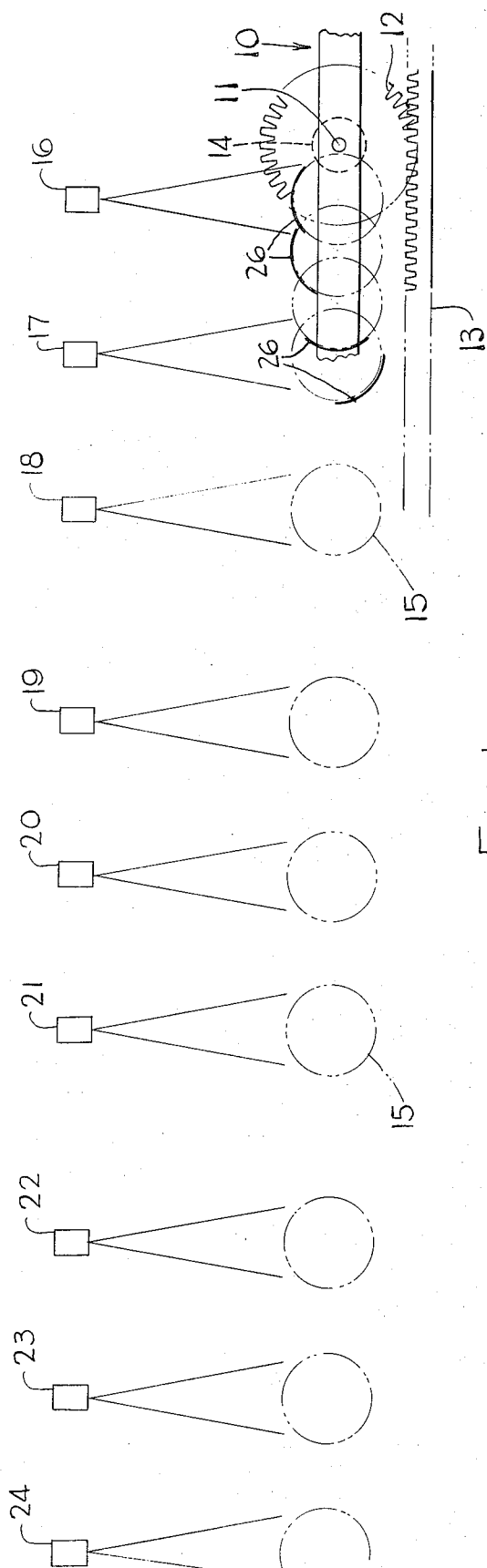


FIG. 1.

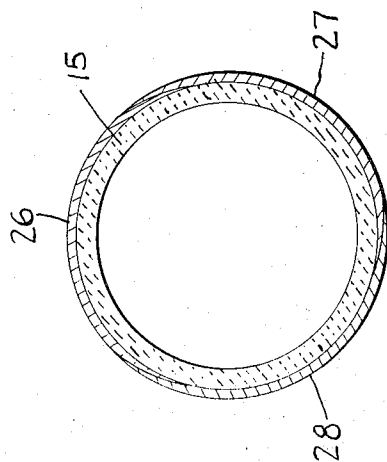


FIG. 2.

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APPARATUS FOR SPRAYING CLYINDRICAL ARTICLES

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for applying uniform spray coatings to generally cylindrical objects such as glass bottles.

In prior art methods of spray-coating bottles and similar objects it has generally been necessary to advance each bottle to a coating station, then rotate and spray the bottle while it is at rest at such station. Another method is to move the spray guns along with bottles being conveyed along a production line and simultaneously rotated. In this case the spray guns must be triggered on and off, particularly for return movement thereof.

Practical complexities of the foregoing spray techniques have led to the use of electrostatic coating methods of various kinds. In one such method known as the Ransberg process the articles to be coated are revolved in a circular path about a rapidly rotating disc which distributes the coating material radially. Electrostatic spraying may be used to advantage with materials which are not electrically conductive but is not usable with materials which are electrically conductive such as water base materials and particularly salt solutions such as are employed in ion-exchange treatment of glass surfaces.

SUMMARY OF THE INVENTION

The present invention provides a spraying apparatus wherein full and uniform coverage of the surface of a series of articles is effected while the articles are continuously moving linearly, without any necessity for moving the spray guns, and without the necessity for triggering the spray guns on and off during spraying operation of the apparatus.

In accordance with the present invention the articles, for instance a succession of bottles, are moved along a predetermined path and simultaneously rotated on their vertical axes, the rotation being timed with respect to linear movement of the bottles. The lineal distance through which an individual bottle travels in making one revolution is divided into several equal parts and a corresponding number of spray guns are spaced along a line parallel to the bottle path, the spray guns being spaced at distances equal to the above-mentioned equal parts into which the lineal movement of a bottle during one revolution is divided.

The spray guns are located at the side of the row of bottles where the rotation of the bottles is in a forward direction so that the rotation augments the forward movement of the bottle peripheries at the side toward the spray guns.

By reason of the fixed predetermined relationship between bottle linear movement, the bottle rotation, and the spray gun spacing along the path of bottle travel, the several spray guns are centered against the several sectors into which the bottle periphery is equally divided, as will appear more clearly from a consideration of the exemplary arrangement shown in the drawing and described in the following specification.

By virtue of this arrangement the spray guns may operate continuously and the speed of the conveyor may be varied at will without affecting the relationship of the rotating bottles with respect to the spaced spray guns.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a somewhat schematic plan view of a conveyor showing a bottle progressing therealong past a series of longitudinally spaced spray guns, the bottle being shown in a progressive series of positions; and

FIG. 2 is a transverse section of a bottle showing schematically the manner in which three spaced spray guns apply a relatively uniform coating to the bottle surface.

DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

In FIG. 1 of the drawing a conveyor belt or chain is shown schematically at 10 and the numeral 11 designates one of a series of shafts carried by the belt or chain 10. Each shaft 11 carries a pinion 12 which meshes with a rack 13 which is fixed parallel to the line of movement of belt 10 and each shaft 11 also carries a chuck 14 which grips the upper end of a bottle 15 whereby the latter is suspended from belt 10 and rotated as it moves from right to left as viewed in the drawing.

A series of spray guns 16 through 24 are mounted so as to be directed toward the bottles 15 from the side opposite to rack 13 and the spacing of the spray guns along the path of movement of the bottles is directly related to the linear movement of and the rate of rotation of the bottles, as will now be described.

If we assume in the illustrated embodiment that each pinion 12 has a pitch diameter of 4.5 inches, then the bottle 15 will receive one complete rotation when it moves a linear distance of 4.5π or 14.13 inches. Accordingly, if the spray guns 16, 17 and 18 are spaced apart at a pitch of one third of 14.13 inches or 4.71 inches the three spray guns 16, 17 and 18 will be centered on the bottles 15 as they pass the spray guns at three points uniformly spaced at angles of 120° about the bottle peripheries.

It is to be understood that instead of the group of three spray guns 16, 17 and 18 two or four or more spray guns may be employed, in such cases the spray guns being spaced from each other at a distance equal to π times the pitch diameter of pinion 12 divided by the number of spray guns in the group.

It will generally be preferred to employ spray guns emitting a vertical fan spray and, depending on the height of the bottles being sprayed, two or more vertically spaced spray guns may be employed in place of each spray gun 16, 17 and 18 referred to above.

Still referring to a group of three spray guns by way of example, it is found that, as a given bottle 15 passes one of the spray guns, it receives a coating therefrom which applies a full covering through an angle of the bottle periphery extending for about ninety degrees with the coating feathering out for about thirty degrees at each side of the ninety degrees of full coating.

Thus, when the second spray gun applies its coating the thirty degree feathering at one side of the ninety degree full coating area will overlap with the thirty degree feathering at one side of the coating applied by the first spray gun. This overlap produces a coating of substantially the same density as the fully coated ninety degree areas of each spray gun and therefore after a bottle has passed the three spray guns 16, 17 and 18 it has received a full and uniform surface coating.

FIG. 2 illustrates schematically this overlapping relationship, the three coating segments being designated 26, 27 and 28 in the order in which they are applied. In FIG. 1 the travel of segment 26 as the bottle rotates toward the second spray gun 17 is shown schematically.

As many coats as may be desired, of the same or dissimilar coating materials, may be applied by an extension of the principles exemplified in this description of the operation of a group of three spray guns. For instance, if three coats are to be successively applied a second series of spray guns 19, 20 and 21 and a third series of spray guns 22, 23 and 24 will be provided. In applying multiple coats of the same coating material a full coating of the bottle surface is assured even though one or more of the spray guns happens to be temporarily out of operation.

To insure a full and uniform covering in a three coat operation the application of the second coat may begin at a point on each bottle which is one third farther along the bottle periphery than the beginning of the first coat, that is, so that there is a one third overlap between the coating applied by gun 16 and the coating applied by gun 19. Accordingly, the center of the coating applied by gun 19, instead of being spaced 120° from the coating applied by gun 18, is spaced 160° therefrom. Thus the spacing between guns 18 and 19, using the representative figures given above, will be 6.28 inches.

The third coat applied by spray guns 22, 23 and 24 will similarly be located to begin the third coat application another 40° farther along than the second coat so that spray guns 21 and 22 will likewise be spaced at about 6.28 inches. Following this same general principle, in a two coat application employing two sets of three spray guns corresponding generally to the spray guns 16 through 21 of the present embodiment, the spray guns for the second coat would be located so as to apply their coatings to overlap the first coat application halfway. Therefore the center of the coating applied by gun 19 would be spaced to apply its coating 180° from the center of the coating applied by gun 18, that is, 120° plus 60° , or about 7.08 inches with the 4.5 inch pitch diameter pinion assumed for purposes of exemplification.

While reference has been had herein to generally cylindrical objects, it is to be understood that this term is used in its broadest sense as including objects of polygonal cross section or other objects which lend them-

selves to treatment in accordance with the spraying principles described above.

A preferred embodiment of the present invention has been described and illustrated herein to illustrate the principles of the invention but it is to be understood that numerous modifications may be made without departing from the broad spirit and scope of the invention.

I claim:

1. Apparatus for spraying bottles comprising conveyor means for moving a succession of bottles linearly through a spraying zone, said conveyor means including means for gripping individual bottles, fixed rack means extending along one side of said bottles and parallel to the line of movement thereof through said spraying zone, pinions fixed with respect to the gripping means and engaging said rack means for rotating said bottles by and upon linear movement thereof whereby the degree of forward movement of each bottle during one complete rotation thereof is constant, and a plurality of spray means spaced along said spraying zone in longitudinal alignment with respect to the path of movement of the bottles to direct spray materials toward said bottles from the sides thereof opposite to said rack means, said several spray means being spaced from each other at a pitch approximately equal to the pitch circumference of said pinions divided by the number of said spaced spray means.

2. Apparatus according to claim 1 including a second plurality of spray means in line with the first mentioned plurality of spray means, said second plurality of spray means likewise being spaced from each other at a pitch approximately equal to the pitch circumference of said pinions divided by the number of said second plurality of spray means.

3. Apparatus according to claim 2 wherein the first of said second plurality of spray means is spaced from the last of the first mentioned plurality of spray means at a distance different from the pitch of spacing of the spray means of said first mentioned plurality whereby the meeting areas of the coatings applied by the second plurality of spray means are out of registry with the meeting areas of the coatings applied by the first mentioned plurality of spray means whereby the coatings of the second plurality of spray means overlap with respect to the coatings of the first plurality of spray means.

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