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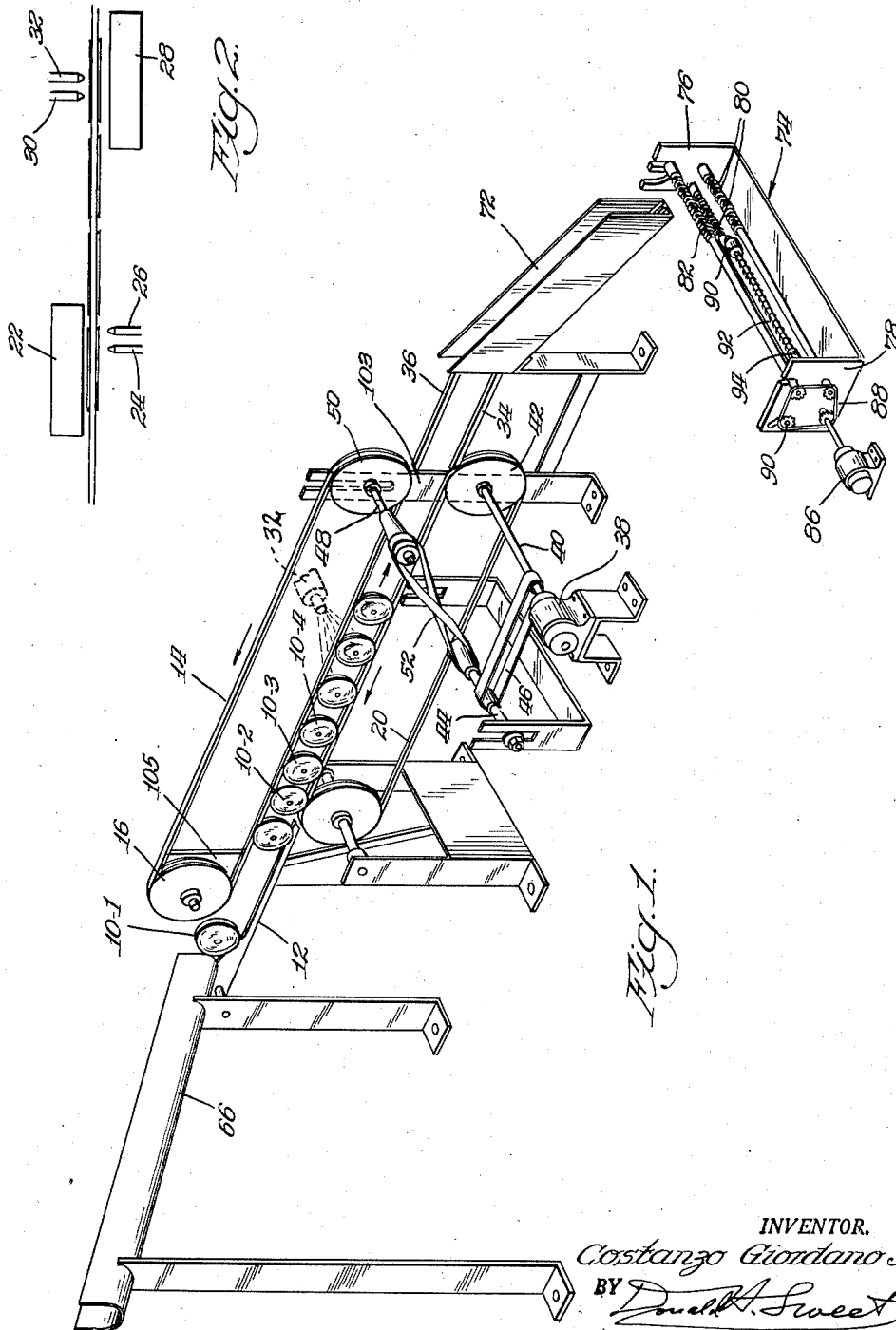
C. GIORDANO, JR

2,579,737

APPARATUS FOR ROTATING AND SPRAY PAINTING DISKS

Filed March 20, 1947

3 Sheets-Sheet 1



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Dec. 25, 1951

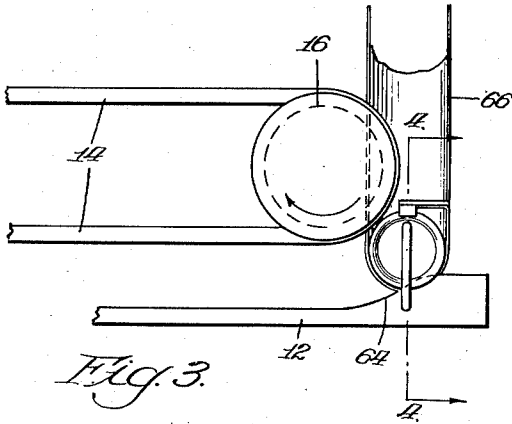
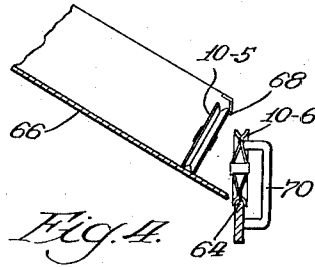
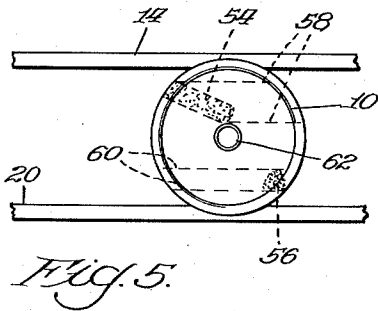
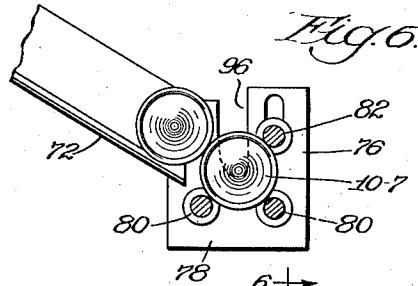
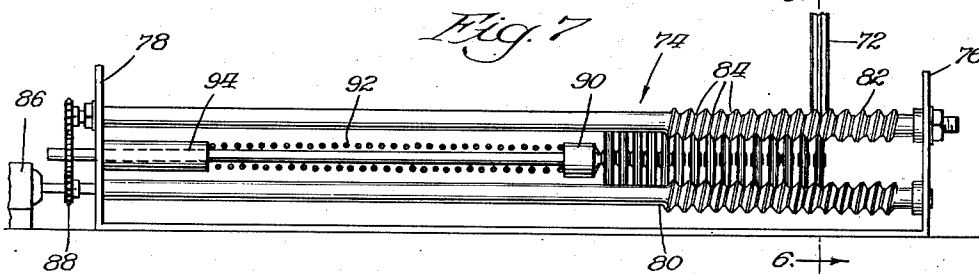
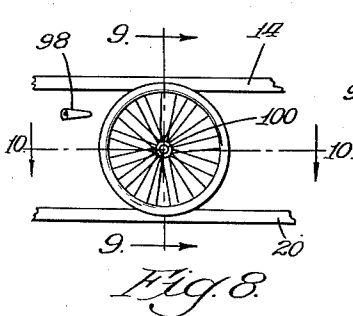
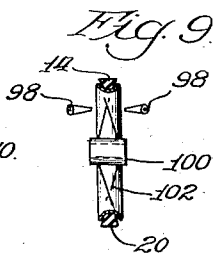
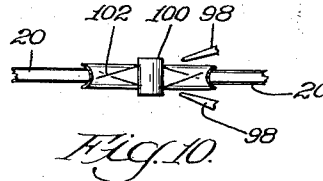
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APPARATUS FOR ROTATING AND SPRAY PAINTING DISKS

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3 Sheets-Sheet 2



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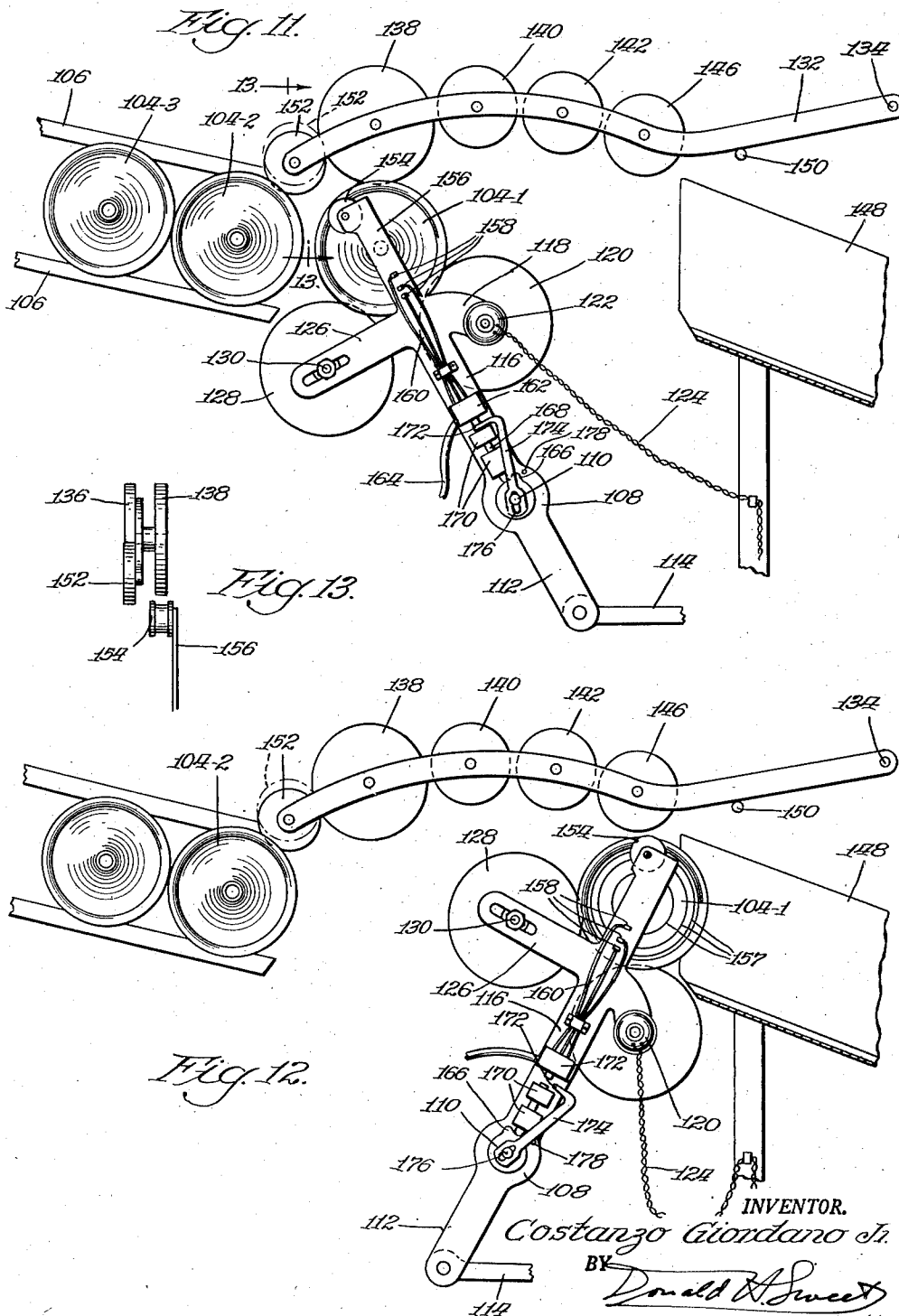
C. GIORDANO, JR

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APPARATUS FOR ROTATING AND SPRAY PAINTING DISKS

Filed March 20, 1947

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,579,737

APPARATUS FOR ROTATING AND SPRAY
PAINTING DISKS

Costanzo Giordano, Jr., Chicago, Ill.

Application March 20, 1947, Serial No. 735,964

7 Claims. (Cl. 91-44)

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My invention relates to the production of articles having their surfaces protected by a coating susceptible of being applied or spread on the object in a more or less plastic or fluid state. It includes among its objects and advantages the automatic handling of large numbers of duplicate articles with a minimum of manual labor. An incidental advantage is an increase in the uniformity of the product and the accuracy with which it is possible to control the thickness of the coating, including desired variations in thickness on various portions of the article.

In the accompanying drawings:

Figure 1 is a partly diagrammatical perspective view of a complete conveyor unit for disk-like objects largely defined by surfaces of revolution, such as metal wheels for small wagons;

Figure 2 is a diagrammatical plan view of the center portion of the equipment of Figure 1;

Figure 3 is an enlarged detail of the discharge end of the feed chute;

Figure 4 is a detail section on line 4-4 of Figure 3;

Figure 5 is a diagram indicating one arrangement for the paint jets;

Figure 6 is a detail of the receiving means as on line 6-6 of Figure 7;

Figure 7 is a side elevation of the delivery and storage rack;

Figure 8 is a diagram similar to Figure 5, indicating the arrangement for handling a wheel with wire spokes;

Figure 9 is a vertical section on line 9-9 of Figure 8;

Figure 10 is a horizontal section on line 10-10 of Figure 8;

Figure 11 is a diagrammatical side elevation of a stripping device;

Figure 12 is a view of the same device with the parts in a different position;

Figure 13 is a detail as on line 13-13 of Figure 11.

The painting operation

In the embodiment of the invention selected for illustration, the primary operation on the wheels 10 takes place as the wheels move from left to right in Figure 1. The receiving track 12 supports an entering wheel 10-1 in a position where it will be contacted by the bight of the upper conveyor belt 14 where that conveyor belt passes around the idler sheave 16. All the tracks and conveyor belts are shaped to fit in the peripheral grooves 18 of the wheels 10 so that the wheels are adequately supported and guided throughout their movement. The belt 14 then carries the

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wheel 10-1 very rapidly along the track 12 until the wheel leaves the track 12 and rides onto the lower conveyor belt 20, which is traveling in the opposite direction with a speed slightly less than that of the belt 14. For instance, if the backward speed of the belt 20 is 90% of the forward speed of the belt 14, the wheels engaged by both belts will have a high peripheral speed of rotation but their progress to the right between the belts will be 10% of what it would be if their lowermost portions were not being carried backward. Thus the wheels 10-2, 10-3, 10-4, etc. will be bunched close together as indicated in Figure 1 and by suitable control of the speed ratio between the belts, they can be made to travel along barely out of contact with each other. As they pass over the belt 20 in this way, they pass in front of a first spray booth 22 opposite which is spray equipment, including discharge nozzles 24 and 26. This paints one side of each wheel. They then pass behind the spray booth 28 located on the opposite side of their plane of movement where the spray equipment indicated as nozzles 30 and 32 will similarly paint the other side of the wheel. The position of one of the nozzles, 32, is indicated in dotted lines in Figure 1. And finally, they are discharged with a substantial velocity of spin and relatively low velocity of translation onto the discharge tracks, comprising a lower track 34 and an upper track 36 spaced above the track 34 just high enough not to bind the wheels between the tracks.

Suitable means are provided for actuating the conveyor belts 14 and 20. The motor 38 drives the shaft 40 carrying the right hand sheave 42 for the belt 20. A counter-shaft 44 is driven from the shaft 40 by means of a belt 46. The shaft 48 carrying the right hand sheave 50 for the conveyor belt 14 is driven from the counter-shaft 44 by a crossed belt 52, riding on slightly tapered pulleys 48 so that shifting the drive belt can produce a precise adjustment of the relative speeds of the conveyor belts.

It will be apparent that the amount of coating applied to each wheel can be maintained uniform and adjusted with a substantial degree of precision. Furthermore, the thickness of the coating at various distances from the center of the wheel may be varied to secure any distribution indicated as desirable by service tests, over a fairly wide range. Referring to Figure 5, I have indicated an upper large spraying area at 54 and a smaller spraying area at 56. One of the wheels 10 is indicated in Figure 5 in position where both

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areas 54 and 56 happen to be covered by the wheel, but it will be obvious that the movement of the wheel past the station areas 54 and 56 will cause those areas to shift as the wheel goes by. Thus, the upper spray at 54 is progressively applied in positions defined by a wide belt indicated in dotted lines at 58 and the lower spray at 56 will function in the narrower belt 60. It will be obvious that the relative positions of the sprays 54 and 56 in a horizontal direction are not significant so far as coating the entire area of the wheel is concerned. However, if some particular area on the wheel, such as the outer peripheral portion, has been subjected during manufacturing operations to deformation, spot-welding, or any other operation which gives it different surface characteristics from portions at a different radial distance, a different treatment of such a portion can be achieved by having one of the sprays act on the wheel a little before the other one becomes effective. This would make it possible to vary the composition of the sprays and give the first spray a little more wetting or spreading action to compensate for the characteristics of the different portions of the wheel surface.

Furthermore, the positioning of the sprays may be made to secure substantially any desired thickness of coating at different radial distances. In the particular arrangement illustrated in Figure 5, the spray 54 is positioned where it will put material on the entire side surface of the wheel except for the central portion 62 where painting is not desired. However, because the total area of portions near the center is less than portions near the periphery, the coating resulting from the spray 54 will be progressively thinner from the hub out. This may be compensated for by having the spray 54 spray on a tapered area, narrow near the center and wider near the periphery. And it may be additionally corrected by the spray 56 which will deposit no material out to a radial distance about half the size of the wheel and apply coating in relatively large amounts near the outer periphery.

Feed

Suitable means are provided for delivering unpainted wheels to the conveyor belts. I have indicated a rise 64 at the inlet end of the track 12, concentric with the axis of rotation of the sheave 16. Near the top of that rise an inclined trough 66 debouches at such a level that the lowermost unpainted wheel 10-5 in the trough, being restrained at its upper edge by a retaining finger 68, may slip down and fall out of the end of the trough into the position of the wheel 10-6 of Figure 4, with its lowermost portions supported on the rise 64 and its uppermost portion prevented from tipping to the right by a stop 70. And in this position it is prevented from tipping to the left by the adjacent end of the trough 66 and need only move down the rise 64 a little distance to be frictionally engaged by the belt 14 and whisked away down the track 12 as previously described with reference to the wheel 10-1 in Figure 1. Thus it is only necessary for the operators to keep the trough 66 stacked full of wheels to maintain a continuous operation. And by varying the speed of the motor 38, the speed of operation may be adjusted to whatever is desired without changing the speed ratio between the belts 14 and 20. For instance, with 6" wheels, very efficient operation can be obtained when the wheels pass through the machine at the rate of one wheel in a second or a second and a half. Varia-

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tion in the speed of delivery can be secured by varying the speed of the belt 14 because the wheel at 10-6 in Figure 4 is in the way of the wheel 10-5 and the wheel at 10-5 cannot get down into position on the rise 64 until the belt 14 has removed the previous wheel.

Delivery

From the tracks 34 and 36 the freshly painted wheels roll down a gently inclined length of track inside the housing 72. The tracks 34 and 36 can advantageously be of such a length and inclination that the wheels entering them will not move across by their own momentum but will be gently pushed by succeeding wheels so that the wheels enter the inclined section one by one and roll down freely into the receiver indicated as a whole by the reference character 74. The receiver is a simple rack having end plates 76 and 78 supporting two stationary duplicate feed screws 80 and a vertically adjustable feed screw 82. Each of the feed screws includes a threaded portion 84 having deep threads of a general V-shape and preferably with bottoms shaped to secure good guiding engagement with the periphery of a wheel. All three feed screws are driven in unison in a counterclockwise direction as by a motor 86 and a sprocket chain 88 passing over an idler pulley 90 adjustably mounted in the plate 78 to permit vertical adjustment of the screw 82. It will be apparent that a wheel leaving the housing 72 will fall into the position as indicated at 10-7 in Figure 6 and the continuous rotation of the screws will engage its periphery at three spaced points and shift it down the storage rack. I have indicated a plunger 92 having a tapered point adapted to center in the hub 62 of the first wheel and pushed gently to the right by a light compression spring 92 abutting the guide bearing 94 for the plunger. Thus successive wheels, as best indicated in Figure 7, will continue to enter and to be stacked in abutment and moved to the left as indicated in Figure 7 where fifteen such wheels have been stacked.

The receiver 74 is preferably positioned directly adjacent to the conveyor or receiving means of a baking oven (not shown) and an operator standing beside the plate 78 may be equipped with a simple carrying rod by means of which he can move the stacked wheels. At suitable intervals he merely thrusts the rod through all the wheels until the end of the rod strikes the plunger 90 and as the spring 92 is very light he can easily compress it so that his pick-up rod will pass through the last wheel and project beyond. Then he merely grasps this projecting end with one hand and lifts the rod and wheels out of the receiver and transfers them to the oven conveyors. In doing this, it is not necessary for the operator to move with more than ordinary dispatch. If his lifting rod remains in place long enough for the screws to move the last impaled wheel out of alignment with the housing 72, the next wheel may slide down out of the housing until its edge touches the lift-out rod, where it will remain until he picks up the lift-out rod and permits that wheel to fall into the screws and start the next stack. Alternatively, if there happens to be a following wheel in contact with the edge of the wheel at 10-7 when he lifts the wheel 10-7 the following wheel will be pushed back up the housing 72 far enough to let the wheel 10-7 get out, after which the procedure will resume its functioning while the operator disposes of the removed stack. The end plate 78

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is provided with a guide slot 96 to assist the operator in impaling the stack. The bottom of this slot affords a fulcrum so that the operator has the option of reaching over adjacent the plunger 90 to pick up the end of the stack or pushing down on the portion of the pick-up rod still projecting through the plate to pry the stack up part way. The side of the slot 96 opposite the screw 82 is curved outwardly sufficient to provide clearance for the removal of the stack.

Wire wheels

The painting of wheels with wire spokes has long presented a problem of great difficulty, particularly with respect to the waste of excess painting material. In Figure 8 I have indicated a wire wheel carried by the conveyor belts 14 and 20. To minimize the loss of painting material on such wheels, I employ paint nozzles positioned in a substantially horizontal plane at an acute angle to the plane of movement of the wheels. As best indicated in Figures 8, 9, and 10, the twin nozzles 98 are at a level about midway between the level of the hubs 100 and the belt 14. And because the wire spokes 102 taper inwardly, it is possible at this level to have the tips of the nozzles 98 spaced by less than the axial dimension of the hubs 100. At this acute angle the upper portion of the hub will receive a little paint from both nozzles with each nozzle concentrating most of its paint on the hub end nearest it, and the rotation of the hub will distribute the paint around the entire periphery of the hub. The inner surfaces of the remote wire spokes, at the time the wheel passes through the position of Figure 10 with respect to the nozzles 98, will receive direct spray from both nozzles, and the inner surface of the rim will also obtain a coating at this time. And when the wheel of Figure 10 is a little further away from the nozzles 98, the outer surfaces of the near spokes, which, in Figure 10, are a little too close to the nozzles to secure coating all over, will be effectively sprayed. It will be found that discharge of the spray at the acute angle indicated will greatly reduce the amount of spray that will pass through and be lost. For instance, a good deal of the spray that misses the spokes will find its way to the rim or to the hub and the space occupied by the spray from the nozzles 98 contains a much larger proportion of spokes to vacant spaces than would be the case with a spray directed at right angles to the plane of the wheels.

The adjustability of the screw 82 permits accommodation of the device to wheels of different sizes. The tracks 34 and 36 and the housing 72 may be adjustable or easily replaceable. The conveyor belt 20 is preferably fixed, but the sheaves 16 and 50 may be made vertically adjustable on the standards 103 and 105. Such adjustment can be accomplished without replacing the belts 46 and 52 by the simple expedient of mounting the countershaft 44 for vertical adjustment on its support.

It will also be noted that in all the arrangements discussed in connection with Figure 5, as well as the arrangement discussed in connection with Figure 10, practically none of the spray will find its way by direct delivery to either of the belts 14 and 20.

Striping

Referring now to Figures 11 to 13 inclusive, the wheels 104-1, 104-2, and 104-3 may be the product of the process steps indicated in Figure 1, either with or without an intermediate

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baking to harden the uniform coating put on the wheels in Figure 1. Accordingly, the tracks 106 may represent the tracks in the housing 72 if there is no intermediate baking or a new set of storage tracks if the wheels are baked before striping. The striping equipment comprises an oscillating carrier 108 pivoted at 110 and having a downwardly projecting arm 112 connected to a reciprocating pitman 114 for oscillating the carrier from the position of Figure 11 to the position of Figure 12 and back again. Above the pivot, the carrier includes a main standard 116 having an arm 118 projecting to the right to carry a drive and transfer roller 120, which may advantageously be driven by a small motor 122 carried on the roller shaft and receiving power through a flexible cord 124. An oppositely projecting arm 126 carries an idler roller 128 adjustably connected at 130 to accommodate the transfer carrier to wheels of different sizes. Figure 11 represents a position which may be conveniently considered the beginning of a cycle, with the wheel 104-1 in position and rotating. A guiding arm 132 pivoted at 134 is at this time held in the full line position of Figure 11 by contact between the wheel 104-1 and an oversize idler guiding roller 136 of the same diameter as a front lifting roller 138, and pivoted on the same axis. Beyond the oversize guide roller 136 three smaller guide rollers, 140, 142, and 146, are carried along the length of the arm 132. Movement of the transfer holder to the position of Figure 12 will transfer the wheel 104-1 from the oversize roller 136 to the smaller rollers, 140, 142, and 146 successively so that throughout the movement, the wheel 104-1 will always have contact with a top guide roller to hold it in place. When the position of Figure 12 is reached, the finished wheel 104-1 moves down far enough to pass under the last guide roller 146 and into the housing 148, which may be similar to the housing 72 and deliver the wheels to a second receiver 74. The downward displacement of the arm 132 at this time is limited by a stop pin 150. In the position of Figure 12, the wheel 104-2 is prevented from leaving the tracks 106 by a stop roller 152 on the extreme end of the arm 132. During the movement from the position of Figure 11 to that of Figure 12, the wheel 104-2 has been restrained from leaving the tracks, in the first instance by the wheel 104-1, and the roller 128, and after the roller 128 has gone too far to the right to be effective, by the stop roller 152.

After the wheel 104-1 has been discharged into the housing 148 the transfer carrier moves back to the position of Figure 11. Until near the end of this return movement the stop roller 152 remains in the full line position of Figure 12, but just before the end of the movement, a release idler 154 mounted at the upper end of an extension 156 on the transfer carrier passes under the release roller 138 and lifts the stop roller 152 high enough to allow the wheel 104-2 to pass under it freely. At this time the roller 128 is in a position to prevent premature movement of the wheel 104-2 until, as the carrier reaches the extreme position of Figure 11, that wheel will roll over the roller 128 into the position of the previous wheel in Figure 11 and start rotating. This returns the parts to the original condition of Figure 11 and completes the cycle.

Means are provided for discharging coating during the forward stroke of the cycle to put stripes on the wheels. I have illustrated three striping guns 157 mounted on the extension 156

and supplied by feed tubes 160, controlled by a valve chest 162 which in turn receives its supply from a conduit 164.

To actuate the valve assembly 162 during the forward stroke and not during the reverse stroke, I provide a stationary cam 166 positioned to lift a plunger 168 slidable in guide blocks 170 during the center portion of the movement in either direction. A spacer block 172 lies between the plunger 168 and the valve assembly 162 in the position of Figure 11 so that actuation of the plunger 168 by the cam 166 will open the valves and cause the guns 158 to stripe the wheel. The spacer 172 is a lateral projection on a carrying arm 174 guided on the pivot 110 by a slotted link 176, and displacement of the arm 174 to the right beyond the position of Figure 12 is limited by a stop pin 178 on the carrier 108. It will be apparent that when the other parts reach the position of Figure 12 the spacer 172 will no longer be transmitting force from the plunger 168 and the arm will be free to fall on over into the position shown in Figure 12. During the return movement the plunger 168 will rise but the absence of the spacer 172 makes the connection inoperative to open the valves. After the arm 174 has passed the vertical position it will tend to fall back toward the position of Figure 11 but this will be prevented by the end of the plunger 168 until the plunger has moved down off the cam 166. Thereupon the arm and spacer will fall on over to the left into the position of Figure 11 and render the connection operative during the first half of the next cycle.

Others may readily adapt the invention for use under various conditions of service by utilizing the one or more of the novel features disclosed, or equivalents thereof. As at present advised, with respect to the apparent scope of my invention, I desire to claim the following subject matter.

1. Painting equipment comprising, in combination: linear parallel traveling supports; means for driving said supports in opposite directions with one of them traveling slightly faster than the other; means for simultaneously varying the speeds of both supports without changing the speed ratio between them; the upper one of said supports having a portion extending beyond the other support at the inlet end; track means below said extending support portion adapted to guide an object between said track means and the opposing support; feed means arranged to discharge objects onto said track means in a position to be engaged by said extending support portion and moved away; said means being positioned where the previous object obstructs delivery of a following object until said moving support removes it; whereby a succession of objects move along in predetermined closely spaced relationship between said moving supports; means for projecting coating over fixed areas against said bodies as they move along between said supports, whereby the rotation of said bodies distributes the coating circumferentially; receiving tracks positioned to receive and guide finished objects delivered by said supports; and automatic means for accumulating said finished objects in a stack accessible to an operator for simultaneous removal of a plurality of finished objects.

2. Painting equipment, comprising, in combination: linear parallel traveling supports; means for driving said supports in opposite directions with one of them traveling slightly faster than the other; means for simultaneously varying the speeds of both supports without changing

the speed ratio between them; the upper one of said supports extending beyond the other support at the inlet end; track means opposite said extending support portion adapted to guide an object between said track means and the opposing support; means for projecting coating against a body moving along between said supports; whereby the rotation of said body distributes the coating circumferentially, and the translation of said body varies the point of impact and limits the amount of coating to a predetermined value.

3. Painting equipment, comprising, in combination: opposed traveling supports; means for driving said supports in opposite directions with one of them traveling slightly faster than the other; means for delivering an object between said supports to be engaged thereby and receive therefrom a slow movement of translation and a relatively rapid movement of translation; and means for applying coating to said body over fixed areas as it moves along between said supports.

4. Painting equipment, comprising, in combination: opposed traveling supports; means for driving said supports in opposite directions with one of them traveling slightly faster than the other; means for delivering a series of closely spaced objects between said supports to be engaged thereby; means for applying coating at fixed points to said bodies as they move along between said supports.

5. Painting equipment, comprising, in combination: opposed traveling supports; means for driving said supports in opposite directions with one of them traveling slightly faster than the other; means for delivering a series of closely spaced objects between said supports to be engaged thereby; and continuously operating jet means for applying coating at fixed points to said bodies as they move along between said supports.

6. Painting equipment for painting the axially facing surfaces of disk-like objects, each having a peripheral groove, comprising, in combination: supporting means for engaging said object only within said groove and at a plurality of peripherally spaced points to provide complete support for the object; means for moving said supporting means to impart to said object a movement of rotation about the object axis and simultaneous rectilinear movement of translation normal to the object axis; stationary means for projecting paint against the axially facing surfaces of a series of objects as they pass by on said supporting means; guide means for feeding objects to said supporting means; and guide means engaging each object only within its peripheral groove for receiving and storing the freshly painted objects from said supporting means; said supporting means comprising: a lower traveling belt small enough to lie in said peripheral grooves; said lower traveling belt underlying the articles being painted and traveling in a direction opposite to the translational movement of said articles; and an upper traveling belt small enough to enter said peripheral grooves; said upper belt traveling parallel to said lower belt and overlying said articles; said upper and lower belts together constituting the sole support for an article engaged between them; said upper belt moving in the same direction as the translational movement of said articles; said upper belt having a speed slightly greater than said lower belt, whereby the rotation of each object is proportional to the arithmetical mean between the

belt speeds, and the translational speed of each object is equal to the difference between the belt speeds; and continuously adjustable manually operable means for varying the ratio between the belt speeds.

7. Painting equipment for painting the axially facing surfaces of disk-like objects, comprising, in combination: supporting means for engaging said object only peripherally at a plurality of spaced points to provide complete support for the object; means for moving said supporting means to impart to said object a movement of rotation about the object axis and simultaneous rectilinear movement of translation normal to the object axis; stationary means for projecting paint against the axially facing surfaces of a series of objects as they pass by one said supporting means; guide means for feeding objects to said supporting means; and guide means engaging each object only peripherally for receiving and storing the freshly painted objects from said supporting means; said supporting means comprising: a first traveling belt engaging the periphery on surfaces inclined in both directions to secure radial and axial grip; a second traveling belt traveling parallel to said first belt and engaging said articles at points diametrically opposite their contact with said first belt; said belts

together completely supporting the article engaged between them; said first belt moving in the opposite direction from the translational movement of said articles; said second belt having a speed slightly greater than said first belt, whereby the rotation of each object is proportional to the arithmetical means between the belt speeds, and the translation of each object is equal to the difference between the belt speeds.

COSTANZO GIORDANO, JR.

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