

July 1, 1969

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3,452,709

MACHINE FOR COATING INTERIOR OF CONTAINERS

Filed Jan. 10, 1966

Sheet 1 of 3

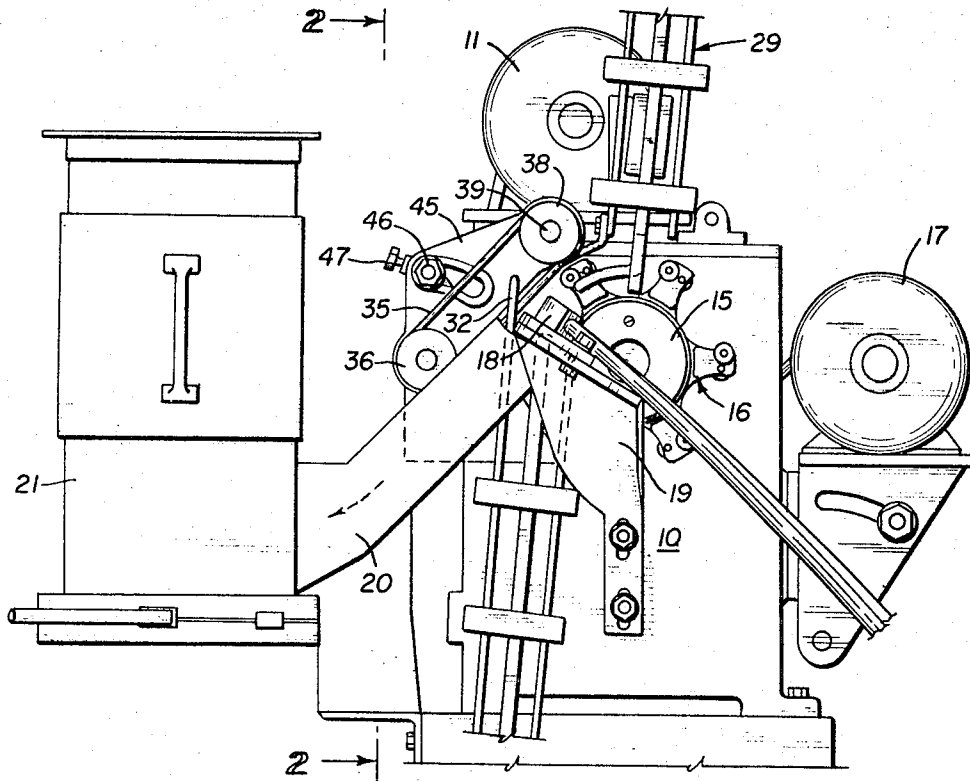


Fig. 1

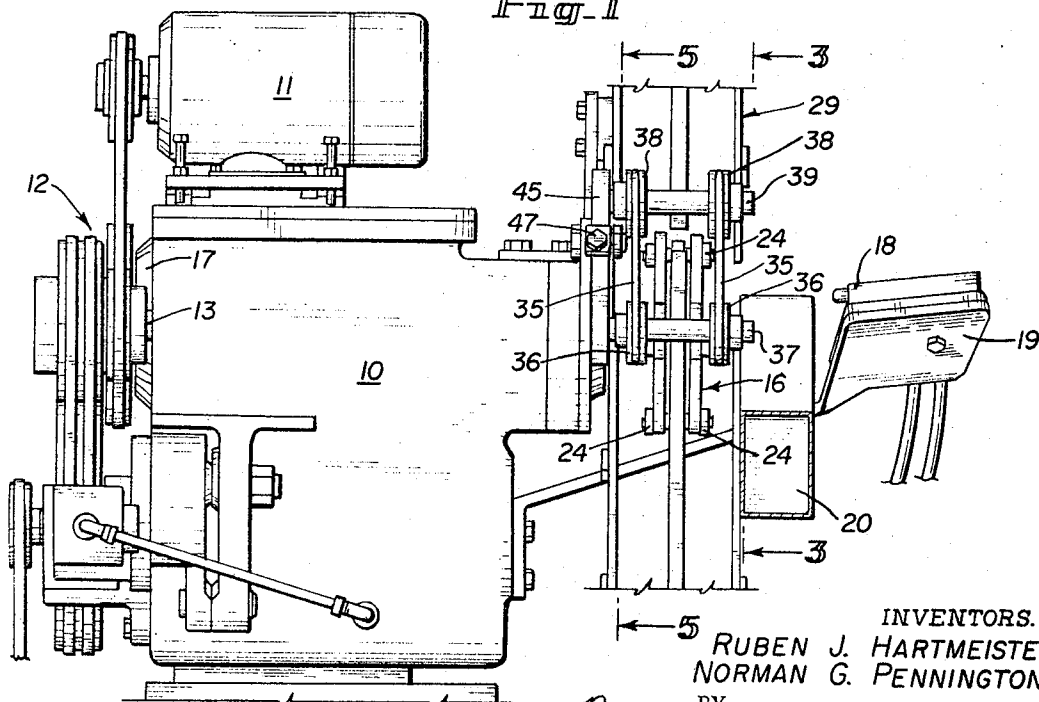


Fig. 2

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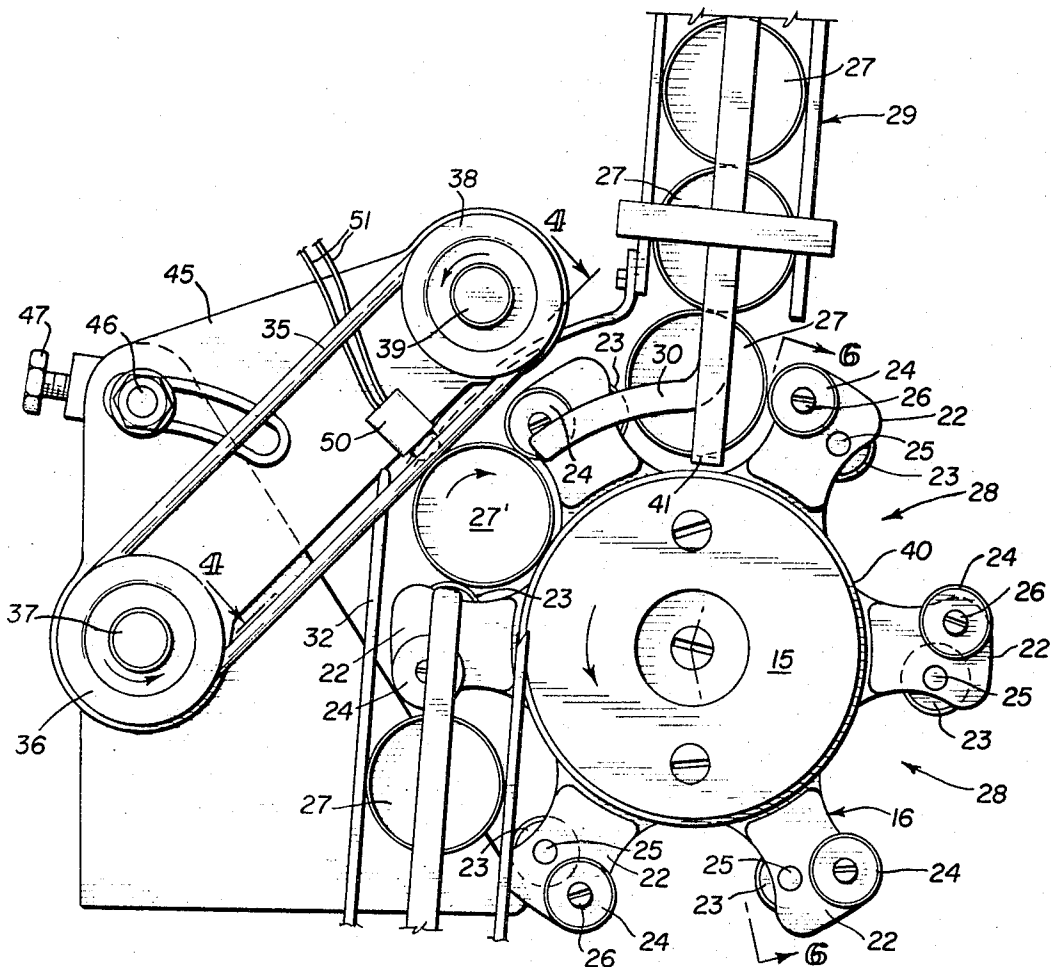


Fig. 3

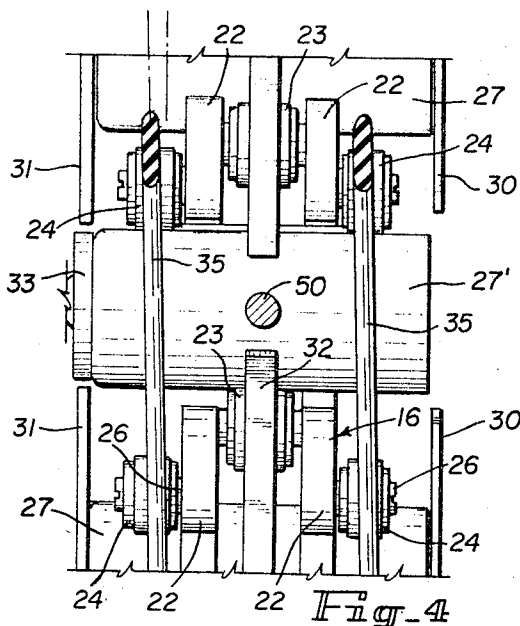


Fig. 4

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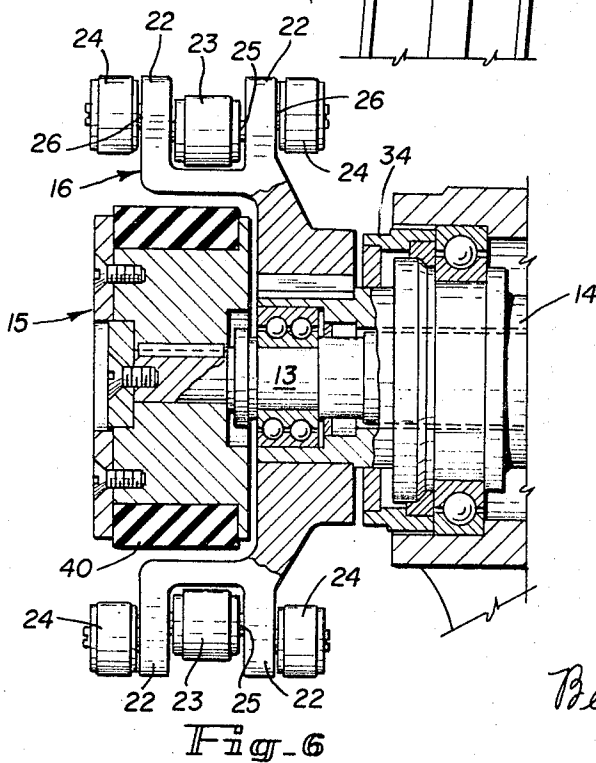
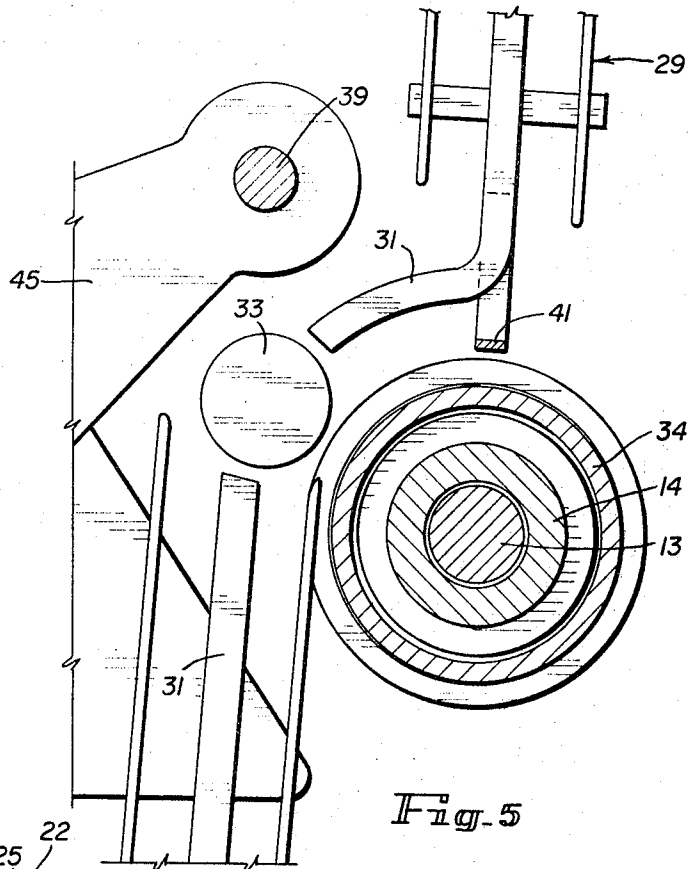
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MACHINE FOR COATING INTERIOR OF CONTAINERS

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17 Claims

ABSTRACT OF THE DISCLOSURE

A coating machine for coating the interiors of containers. Containers are carried in star wheel pockets between arms provided with guide rolls. Each container is rotated while in coating position by a driven wheel rotated in one direction having peripheral rotation-producing contact with a side surface of the container, and a flexible belt or belts driven in the opposite direction and located to have rotation-producing contact with the opposite side of the container. The belt is driven to travel at the same speed as the linear speed of the tread of the wheel, whereby uniform speed rotative contact is applied on opposite sides of the container and deforming pressure is avoided.

This invention relates to a machine for coating the inner surfaces of containers such as metal cans and the like with lacquer or other protective coatings. The invention is particularly adapted for coating the interior surfaces of fragile cans without injury to the cans. Such cans may be made of very thin gauge aluminum, $\frac{3}{1000}$ to $\frac{5}{1000}$ inch thickness, and consequently must be handled gently to avoid the application of pressures which cause the cylindrical bodies to become deformed.

Therefore the main object of the invention is to produce a machine for coating the interior surfaces of fragile containers, in which the containers are held in spraying position and rotated about their axes a plurality of times during the spraying operation by rotative forces which move in opposite directions and which contact the container bodies externally at opposite sides and in different areas between the ends of the bodies. By the unique construction, location and arrangement of the can rotating means, pressures originating from two different driving forces are distributed evenly against opposite sides of the cylindrical can bodies. Thus deforming pressures heretofore resulting from single rotating means are minimized.

Another object of the invention is to achieve the internal coating while the cans are being held by mechanism which contacts the cans without marring the external finish or decoration.

Another object is to provide for continued rotation of the cans while they are being sprayed internally, and to provide for continued bodily movement of the cans after spraying to prevent "running" of the coating and consequent uneven thickness of the coating which occurs when the coated cans are allowed to remain stationary for even a short period of time before the coating has had time to become set.

Another object of the invention is to provide can rotating means which also serve to urge the bottoms of the cans to bear against a guide and to prevent the cans from tending to move in axial directions away from the bottom guide. Thereby the cans are held in proper spray receiving positions by the same means which rotate the cans about their own axes during the spraying operation, and an upper end guide can be dispensed with at the spray-

ing position, thereby avoiding contamination of the guide with the sprayed coating.

Another object is to combine mechanism for continuously rotating a can about its axis while located in spray receiving position, with mechanism for intermittently moving cans and holding them in bodily stationary position while being rotated and sprayed. For this purpose we employ an intermittently moving star wheel and a continuously rotating can contacting wheel mounted coaxially, the latter being located concentrically inwardly of the star wheel arms in such position that the peripheral surface of the can rotating wheel contacts the cylindrical surface of a can held between adjacent arms of the star wheel. Cooperating with the can rotating wheel are a pair of O-belts, parallel with each other, located so that they contact can surfaces on the side of the can opposite that contacted by the periphery of the can-rotating wheel. The O-belts are spaced apart from each other a distance greater than the axial thickness of the rotating wheel whereby the O-belts and wheel contact can surfaces in different areas on opposite sides as will be explained hereinafter in connection with the drawings.

Another object of the invention is to provide idler rollers mounted in the radially projecting arms of the star wheel for guiding the cans into spray receiving positions. The cooperating rollers which guide one can are mounted in adjacent arms of the star wheel but in different planes perpendicular to the axis of the wheel, so that they are not opposite each other. Their guiding action is directed to opposite sides of a can in areas which are not directly opposed to each other, a single roller being mounted in one of the star wheel arms in position to lightly contact the cylindrical side of a can midway between its ends, while two rollers are mounted in the other of the adjacent arms in position to lightly contact the side of a can near its respective ends.

The respective can guiding and can rotating mechanisms contact the cans gently at opposite sides of the cylindrical bodies in areas not directly opposite each other, and avoid application of surface deforming pressures on the fragile cans.

As shown herein, the cans are sprayed while in axially horizontal positions. In referring to the can ends, the open end may be described as the top end, and the closed bottom of the can as the bottom end, but preferably the cans are fed to the coating machine and carried by the star wheel to the spraying location in horizontal positions.

In the drawings:

FIG. 1 is an elevational front view of a coating machine embodying our invention.

FIG. 2 is a vertical sectional view in the plane of the line 2—2 of FIG. 1.

FIG. 3 is an elevational front view, on an enlarged scale, of the can moving and rotating means as they appear when viewed in the plane of the line 3—3 of FIG. 2.

FIG. 4 is a sectional view in the plane of the line 4—4 of FIG. 3, on a slightly larger scale.

FIG. 5 is a vertical sectional view in the plane of the line 5—5 of FIG. 2.

FIG. 6 is a transverse vertical sectional view in the plane of the line 6—6 of FIG. 3.

In that embodiment of the invention shown in the drawings, a frame 10 supports a motor 11 which drives gearing and belts indicated as a whole at 12 for rotating the shaft 13 on which is mounted the cam rotating wheel 15. A star wheel 16 is mounted on a shaft 14 which surrounds the shaft 13 as shown in FIG. 6. The shaft 14 is driven by intermittent indexing mechanism (not shown) which is driven by a motor 17 to give intermittent rotary motion to the star wheel 16.

A spray gun 18 of fan-spray type is supported adjacent the coating machine as shown in FIG. 2 to direct lacquer

or other protective coating into the open end of a closed bottom can. The gun mount bracket 19 is adjustable. A shield communicates with a conduit 20 which conducts excess coating material into the suction chamber 21. For sake of clarity, a can being sprayed has been omitted from FIG. 2, but is shown in FIGS. 3 and 4.

The star wheel 16 is best shown in FIGS. 1, 3 and 6. It comprises a plurality of radially extending arms 22 in each of which are mounted an idler roller 23 projecting peripherally from one side of the arm and a pair of idler rollers 24, 24, projecting peripherally from the other side of the arm 22. Each of the arms 22 is U-shaped in axial cross section, as shown in FIG. 6, with the roller 23 mounted on a shaft 25 between the parallel extensions of the U-shaped arm 22, and the rollers 24, 24, mounted on shafts 26, 26 at opposite outer sides of the extensions of the U-shaped arm 22. The shafts 25, 26, are axially parallel but spaced from each other, so that the roller 23 of one arm 22 faces and cooperates with rollers 24, 24 of an adjacent arm 22 to guide one can 27 between them, as shown in FIGS. 3 and 4.

The spaces between adjacent arms 22 form pockets 28 larger in width than the diameter of a can 27. The distance between peripheries of roller 23 and rollers 24 which cooperate with each other to guide a can 27 in a pocket 28 is equal to the external diameter of the can, such that the can is guided gently by slight contact without pressure while carried by the star wheel in its intermittent rotary movement to place a can 27 in the spray receiving position of can 27' in FIG. 3. Cans 27 pass downwardly in the chute 29, between front guide 30 and back guide 31 located adjacent the can ends, into star wheel pocket 28 between rollers 23, 24, for movement into spray receiving position. An upper guide 32 extends across the center of the cylindrical side surfaces of the moving cans as shown in FIG. 4, but is cut away immediately above the can 27' in spray receiving position. The back guide 31 is cut away to accommodate a spinner 33 located in axially registering position relatively to the can 27'. The spinner 33 is an idler rotary member to which motion is transmitted by a can 27' while being rotated by the mechanism about to be described.

The can rotating mechanism comprises the rotated wheel 15 and a pair of O-belts 35 mounted on pulleys 36 on driven shaft 37 and on idler pulleys 38 on shaft 39 (FIG. 2). The wheel 15 is constructed as shown in FIG. 6, mounted on shaft 13 concentric with star wheel shaft 14, and seal 34, and located concentrically inwardly of the U-shaped arms 22 of the star wheel 16 in such position that the resilient tread 40 of the wheel 15 is accessible in the pockets 28 of the star wheel 16 between the arms 22 thereof. Cans 27 passing downwardly in the chute 29 fall, one by one, into a pocket 28 immediately beneath the chute, and in that position are not rotated about their axes, but are carried into the position of can 27' (FIG. 3). Until each can reaches that position, which is the spray receiving position, it is held on a ledge 41 which separates the can side surface from the tread 40 of the constantly rotated wheel 15. As the star wheel 16 carries the can past the ledge 41, into the position of can 27', the side of the cylindrical can is contacted by the tread 40 of the rotated wheel 15. At the same time, the opposite side of the can comes into contact with the O-belts 35 which are driven to travel at the same speed as the linear speed of the tread 40 of the wheel 15.

The pairs of pulleys 36, 38, are so disposed that the O-belts trained thereon are parallel to each other but travel in parallel directions which extend at a slight angle to the direction perpendicular to the axis of the can. This is shown in FIG. 4. The effect of this slightly angled position of the O-belts relatively to the cans is to urge the cans to remain in end contact with the spinner 33 and to avoid any tendency to move in axial direction away from the spinner during the rotation of the cans about their axes during the spraying operation.

By comparing FIGS. 4 and 6, it will be noted that the axial thickness of the rotated wheel 15 is less than the axial thickness of the star wheel arms 22 and rollers 24 thereon, and less than the space between the two O-belts 35. Therefore when a can is held in the star wheel pocket 28 between the rollers 24 of one star wheel arm 22 and the roller 23 of an adjacent arm 22, and carried to the spinner 33 in end contacting position, the rotated wheel tread 40 contacts one side of the can about midway between its ends while the O-belts contact the opposite side of the can in areas removed from the longitudinal center of the can. Thus the rotation producing pressure applied by the two separate forces (the O-belts 35 and wheel tread 40), against opposite sides of the can 27', is not applied to areas directly opposite each other but is distributed in different areas between the can ends. The resilient character of the tread 40 and the yielding contact exerted by the O-belts produce rotation of the cans without deformation of the fragile walls.

The O-belt assembly is mounted on a bracket 45 provided with adjusting means 46, 47 for adjusting the positions of the O-belts 35 relatively to the cans to be sprayed.

A proximity switch 50 with electrical wiring 51 is located in sensing position relatively to the side of a can 27' for the purpose of rendering the spray gun 18 inoperative in the event no can 27 has moved into spray position. There is no physical contact between the switch and cans. An electrical switch (not shown) on the Geneva movement worm gear actuates the spray gun 18 so that it sprays when the star wheel 16 has moved a can into the spraying position occupied by the can 27'. The speed of operation of the O-belts and rotated wheel 15 is such that the can 27' is rotated a plurality of times while in the spraying position and during one or more of said rotations of the can 27' the gun sprays coating material into the can.

As shown in FIG. 3, the coated can is carried by the star wheel momentarily and then drop by gravity into a chute from which it is elevated in a continuous movement which prevents the coating from becoming uneven in thickness before it hardens into a uniform coating. The coated cans are not retained by the star wheel in its intermittent movement which would result in non-uniform distribution of the coating, but are dropped immediately after the completion of the simultaneous coating and rotation of the cans.

The fan shape of the spray combined with repeated rotation of the cans insures uniform coating without reciprocation or movement of the spray gun.

In describing the invention, reference has been made to a particular example embodying the same, but we wish it to be understood that the invention is not limited to the construction shown in the drawing and that various changes may be made in the construction and general arrangement of parts without departing from the invention as defined in the appended claims. For example, while we prefer to use a wheel 15 of less axial thickness than the space between the O-belts 35, a wheel of greater thickness may be used.

As pointed out herein, the proximity switch 50 does not contact the cans which are carried past the switch. This is desirable in order to avoid marring the exterior surfaces of the cans.

Another feature of the invention is the fact that the guide rollers 23, 24, at opposite sides of a pocket 28 are independent of similar rollers at opposite sides of an adjacent pocket 28. In prior art machines, it has been customary to use a roller (or more rollers axially aligned) located between container holding pockets to serve as the guiding roller or rollers between two adjacent pockets. The result of such arrangement has been to transmit rotary motion from the container in one pocket to the container in the adjacent pocket through the intermediate roller (or axially aligned rollers). Such spinning motion imparted to the cans while carried in the

star wheel is undesirable. Therefore in the machine herein described and claimed, guide rollers 23, 24, cooperate with each other to guide a can in one pocket independently of rollers 23, 24 which function similarly to guide a can in the adjacent pocket. Thus we avoid sharing the guiding action of a roller or rollers between two pockets, with consequent transmission of rotary motion from the can of one pocket to the can of an adjacent pocket.

It should also be understood that the axial dimensions of the rollers 23, 24, may be varied. Further, that while belts 35 in the form of O-belts are preferred, the form may be varied provided the belts 35 are driven to travel at the linear speed of the tread 40 of the wheel 15.

We claim:

1. In a coating machine for coating a cylindrical container, mechanism for rotating the container while in coating position, comprising

(a) a wheel rotated in one direction having a peripheral surface which has rotation-producing contact with a side surface of the container,

(b) means continuously rotating said wheel so that the wheel will cause rotation of the container,

(c) a flexible belt located to have rotation-producing contact with the opposite side of the container, and

(d) means driving said belt in the direction opposite the direction of rotation of the wheel to travel at the same speed as the linear speed of the tread of the wheel, whereby uniform rotative contact is applied on opposite sides of the container and deforming pressure is avoided.

2. The mechanism for rotating a container defined by claim 1, in which the flexible belt is located to have rotation-producing contact with the container in an area not directly opposite the area contacted by the wheel.

3. In a coating machine for coating the interior surfaces of a cylindrical container, mechanism for rotating the container while in coating position, comprising

(a) a wheel rotated in one direction having a yielding peripheral surface which has rotation-producing contact with a side surface of the container,

(b) means continuously rotating said wheel so that the wheel will cause rotation of the container,

(c) a pair of flexible belts located to have rotation-producing contact with the container in areas spaced apart longitudinally of the container and not directly opposite said wheel, and

(d) means driving said belts in the direction opposite the direction of rotation of the wheel to travel at the same speed as the linear speed of the tread of the wheel, whereby uniform rotative contact is applied on opposite sides of the container and deforming pressure is avoided.

4. The mechanism for rotating a container defined by claim 3, in which the flexible belts are O-belts which contact the container adjacent opposite ends of the container, and in which the peripheral surface of the wheel contacts the container approximately midway between the container ends.

5. The mechanism for rotating a container defined by claim 3, which includes a spinner located to contact the container end when the container is in coating position, and in which the flexible belts are O-belts which travel in parallel directions extending at a slight angle to a direction perpendicular to the axis of the container and avoid tendency of the container to move in axial directions away from the spinner during rotation of the container.

6. A machine for coating the interior surfaces of a cylindrical container comprising

(a) a star wheel having a plurality of radially extending arms spaced apart circumferentially of the wheel to form pockets for reception of containers,

(b) a wheel having a peripheral surface which has rotation-producing contact with a side surface of the container, said wheel being concentric with the star

wheel and located inwardly of the star wheel arms with the peripheral surface of the wheel accessible for contacting containers in the star wheel pockets to rotate a container in one direction,

(c) a pair of flexible belts driven in a direction opposite the direction of rotation of the wheel and located to have rotation-producing contact with the container in areas spaced apart longitudinally of the container,

(d) means continuously rotating the container-rotating wheel,

(e) means intermittently rotating the star wheel and holding the star wheel in stationary position when a container is in spray receiving position, and

(f) a spray gun located to spray material into a container while the star wheel is stationary and the container is being rotated by said belts contacting the container on one side surface and by said wheel periphery contacting the container on the opposite side surface.

7. The coating machine defined by claim 6, in which the peripheral surface of the wheel contacts the container approximately midway between the container ends, and the pair of flexible belts are O-belts which contact a container side surface adjacent opposite ends in areas which are not directly opposite the peripheral surface of the wheel.

8. The coating machine defined by claim 7, which includes a spinner located to contact the container end when the container is in coating position, and in which the O-belts travel in parallel directions which extend at a slight angle to a direction perpendicular to the axis of the container and avoid tendency of the container to move in axial direction away from the spinner during rotation of the container.

9. The coating machine defined by claim 8, which includes front and rear guide members located adjacent opposite ends of the containers, said front guide being cut away opposite the spray gun.

10. The coating machine defined by claim 6, in which the radially extending arms of the star wheel are provided with rollers for guiding containers in the star wheel pockets, the rollers of adjacent arms facing a pocket and being located in non-opposite peripheral relationship whereby said rollers gently contact different side surfaces of the containers in areas spaced apart from each other axially of the containers.

11. The coating machine defined by claim 6, in which the flexible belts are trained over pulleys mounted on a bracket which is adjustable relatively to the star wheel and container-contacting rotated wheel.

12. The coating machine defined by claim 6, which includes a proximity switch located adjacent the side of a container when in spray receiving position, and means controlled by the switch for automatically inactivating the spray gun when no container is in spray receiving position.

13. The coating machine defined by claim 6, in which the means continuously rotating the container-rotating wheel is a rotated shaft, and the means intermittently rotating the star wheel is a rotated shaft, said shafts being co-axial and one being surrounded by the other.

14. The coating machine defined by claim 6, in which the container-rotating wheel and the pair of flexible belts are driven to travel at the same linear speed whereby uniform rotative contact is applied on opposite sides of the container and deforming pressure is avoided.

15. The coating machine defined by claim 6, in which the container being coated is rotated about its axis approximately seven times while held by the star wheel in spray receiving position and is internally sprayed approximately three times during said period, and is kept in motion after said spraying and rotating operation to prevent "running" of the coating and becoming uneven in thickness before hardening into a uniform coating.

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16. The coating machine defined by claim 6, in which the container-rotating wheel is of less axial thickness than the distance between the belts of the pair of flexible belts, whereby said wheel and belts contact containers at opposite sides in non-opposite areas, and rotation-producing pressure on the container is distributed evenly on opposite sides of the container.

17. The coating machine defined by claim 6 in which the radially extending arms of the star wheel are provided with rollers for guiding containers in the star wheel pockets, the roller of one arm facing a pocket being independent of a roller mounted in the same arm but facing an adjacent pocket, whereby rotary motion cannot be transmitted from a container in one pocket to a container in an adjacent pocket.

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U.S. Cl. X.R.

113—115; 118—318, 319; 198—33

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