Nov. 6, 1962 H. G. HENRICKSON 3,062,177

APPARATUS FOR COATING THE INTERIOR OF CONTAINERS

Filed March 3, 1959 5 Sheets-Sheet 1

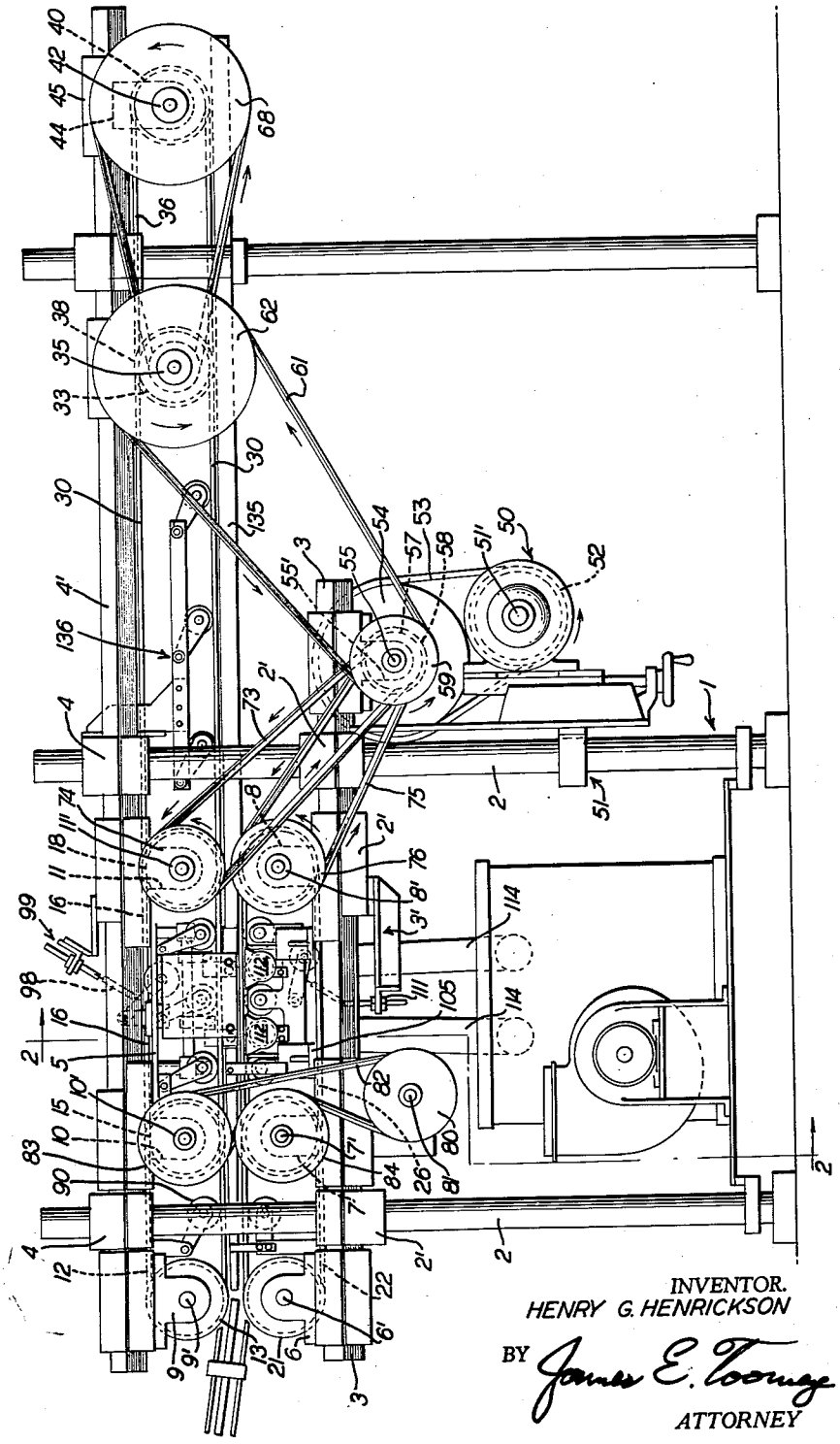

FIG. 1.

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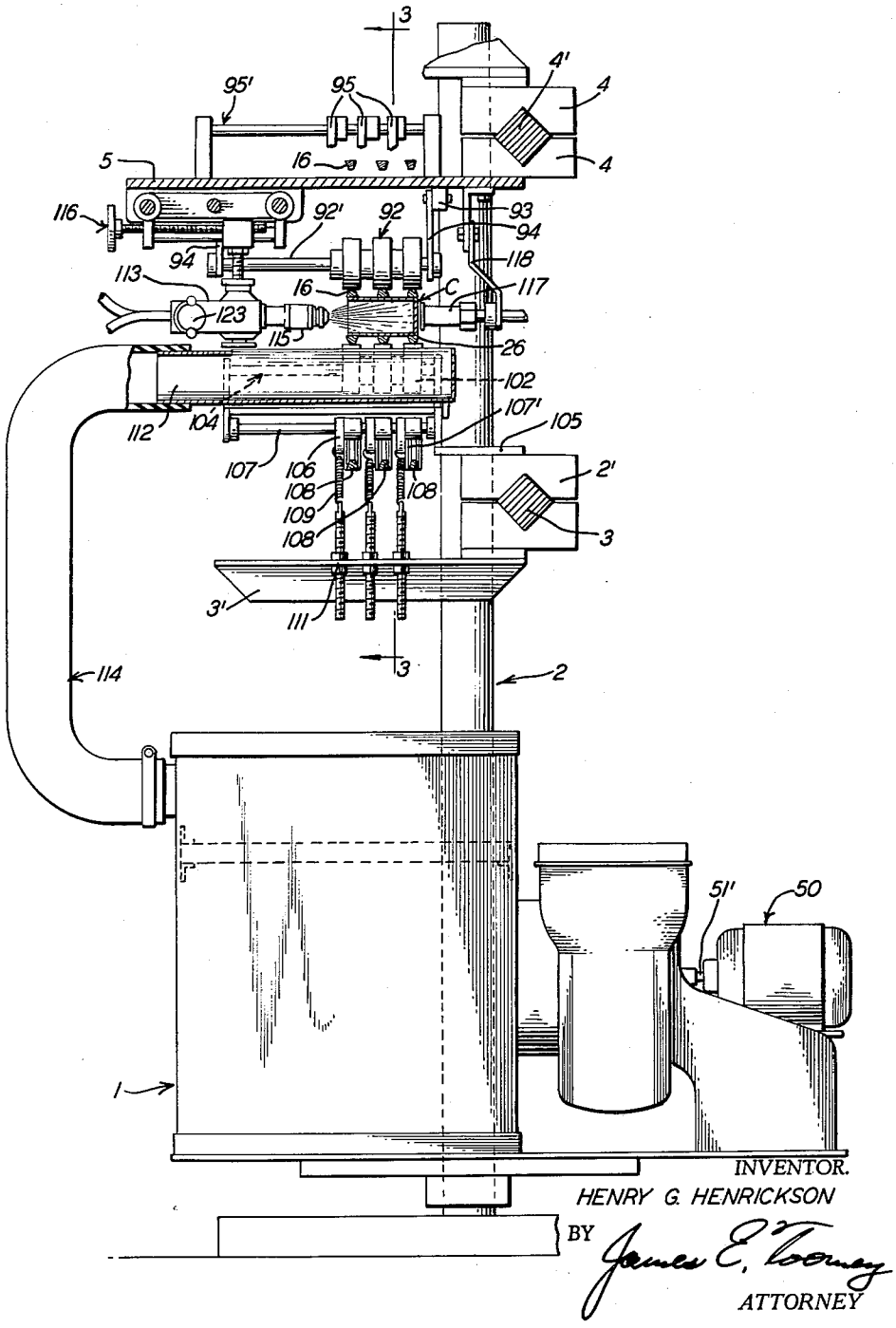
Fig 2.



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APPARATUS FOR COATING THE INTERIOR OF CONTAINERS

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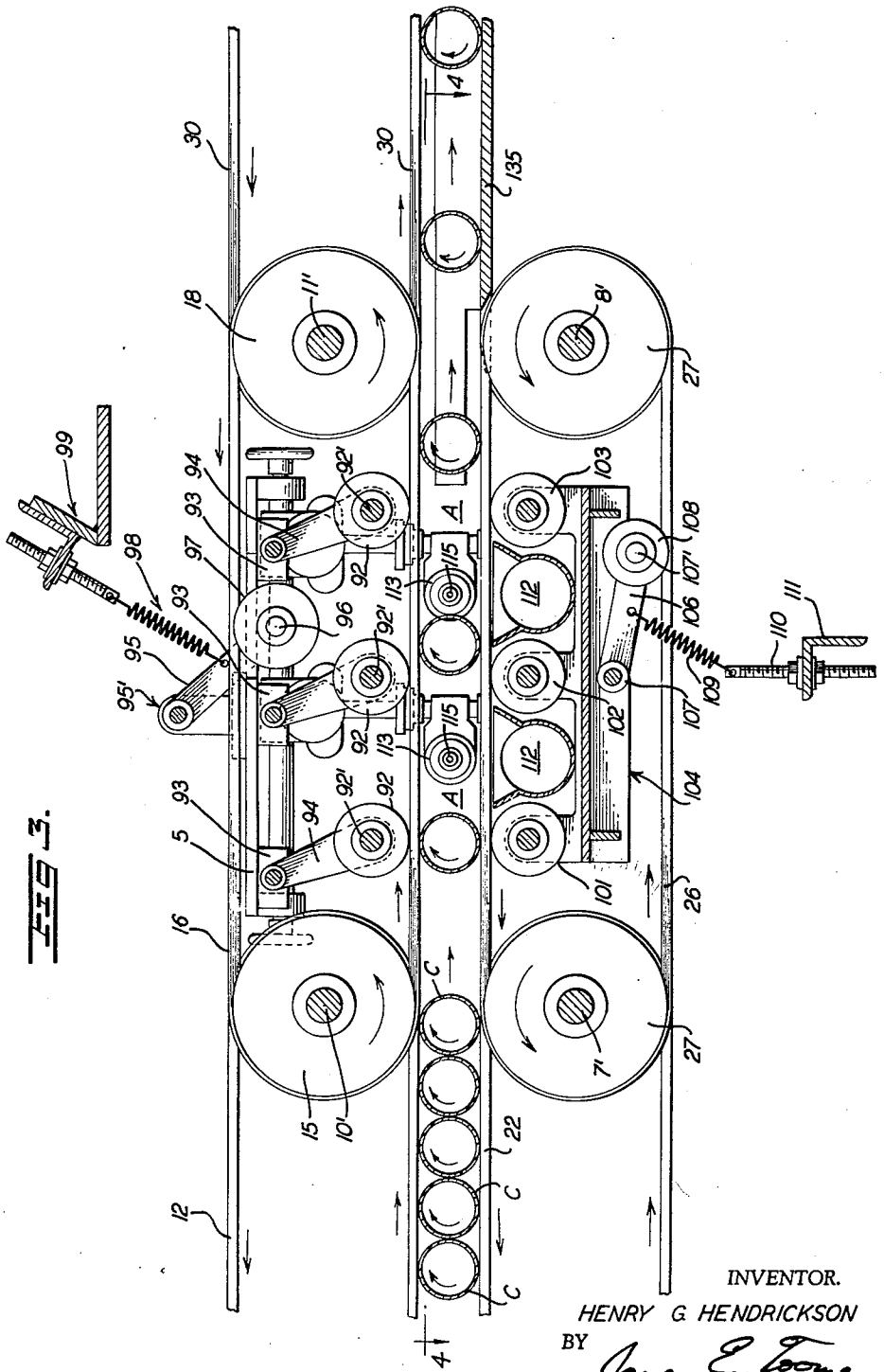

FIG. 3.

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APPARATUS FOR COATING THE INTERIOR OF CONTAINERS

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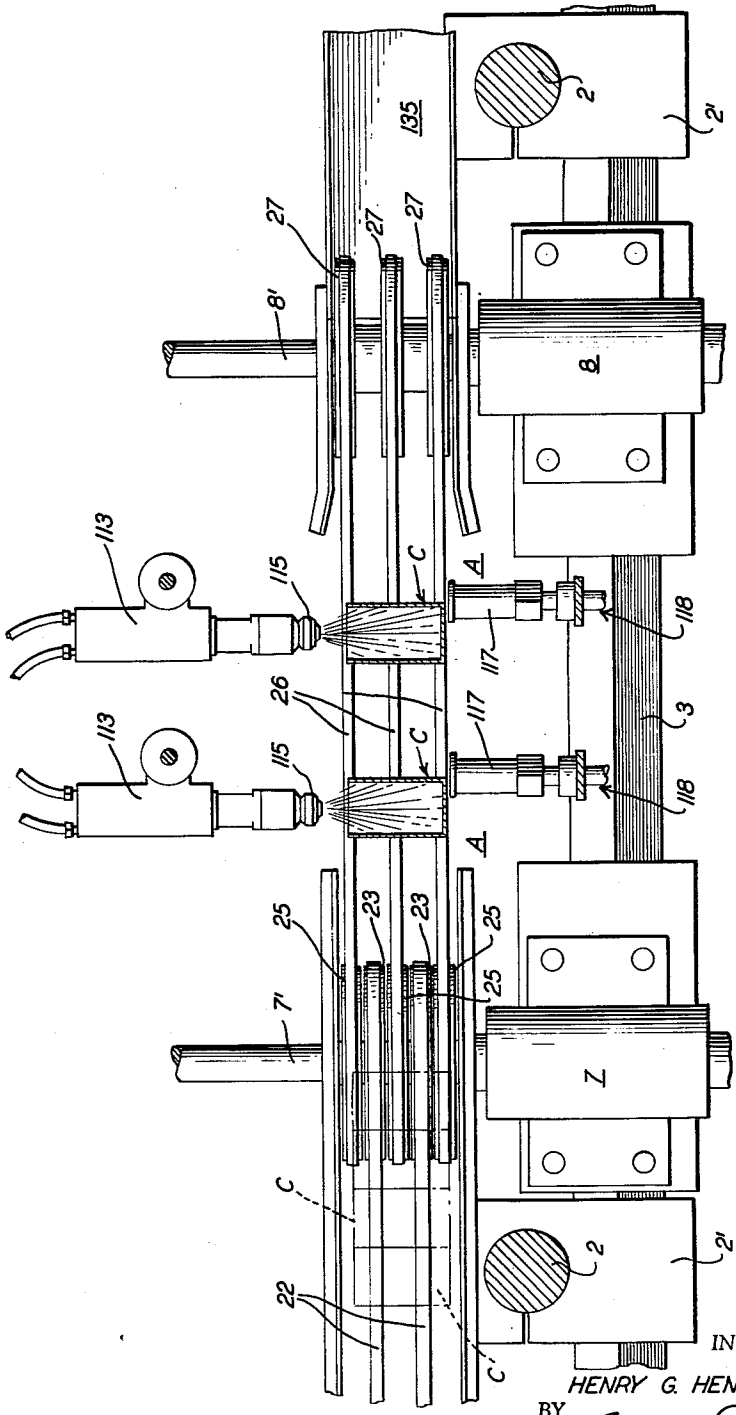

FIG. 4.

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APPARATUS FOR COATING THE INTERIOR OF CONTAINERS

Filed March 3, 1959 5 Sheets-Sheet 5

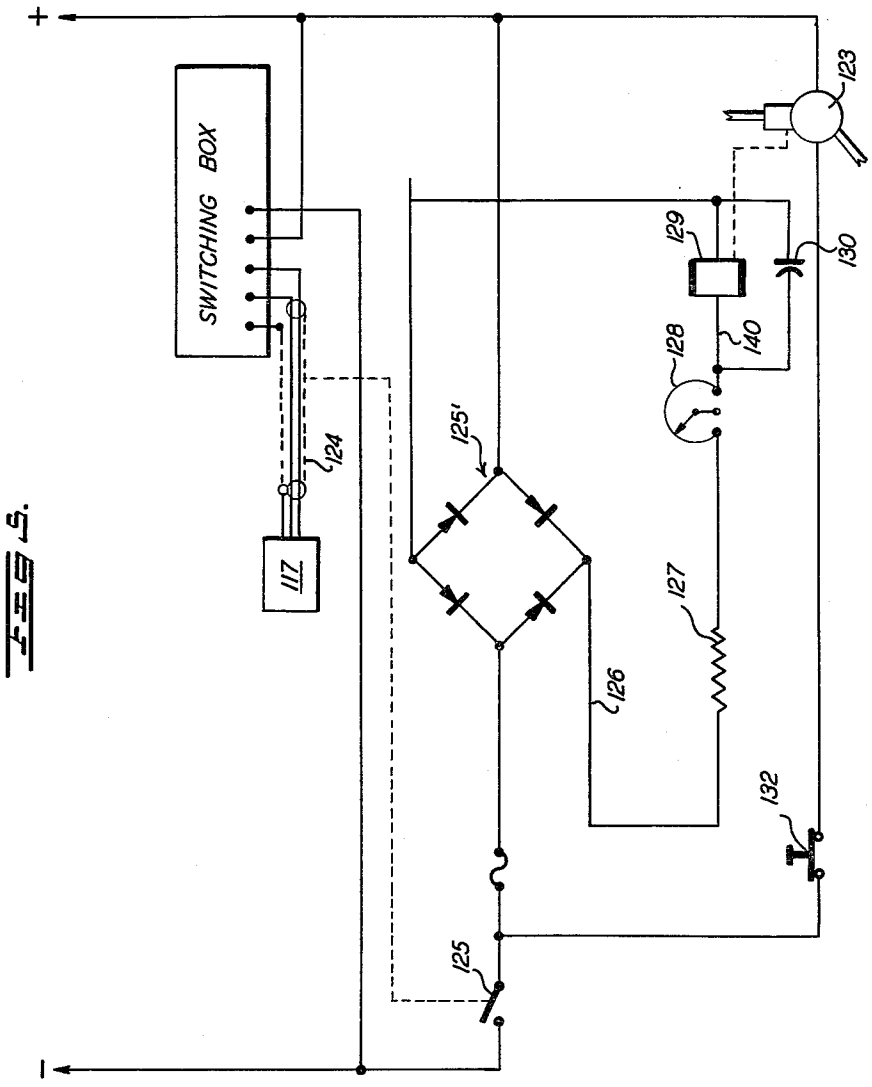

FIG. 5.

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APPARATUS FOR COATING THE INTERIOR OF CONTAINERS

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This invention relates to a new and useful improvement in machines for coating the interior surfaces of containers. More particularly, it is concerned with providing a novel apparatus for applying a uniform coating to the interior surfaces of a rotating container or can.

Accordingly, it is a primary purpose of this invention to provide a novel apparatus for coating the interior surfaces of containers, wherein means are provided for transferring an open ended container from one station to another station along a linear path and past a spraying nozzle means while at the same time continuously rotating the container so that a uniform, even coating can be applied to substantially the entire interior surface or surfaces of the container together with means for energizing the spraying nozzle means at a predetermined time.

Other purposes and advantages of the instant invention will become more apparent from a review of the following detailed description when taken in conjunction with the appended drawings wherein:

FIGURE 1 is an overall side elevational view of the container conveying and spraying apparatus of the instant invention;

FIGURE 2 is a partial sectional view with parts removed of the conveying and spraying apparatus shown in FIGURE 1, when taken along line 2—2 thereof;

FIGURE 3 is a sectional view with parts removed, when taken along line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view with parts removed, when taken along line 4—4 of FIGURE 3; and

FIGURE 5 is a schematic diagram of one embodiment of a suitable control system which may be employed to actuate the spray nozzles of the coating and conveying apparatus of FIGURES 1–4.

With further reference to the drawings and in particular FIGURE 1 the conveying and coating machine of the instant invention is generally comprised of a base frame 1. The frame includes the usual legs 2 anchored to the floor of the building. Adjustably affixed to legs 2 by means of brackets 2′ and support rod 3 is a table or platform 3′. Secured to the upper portions of legs 2 by means of brackets 4 and the support rod 4′ is an upper platen or support 5. Secured to the rod 3 by suitable bracket means are journal bearing members 6, 7 and 8. These bearing members respectively support shafts 6′, 7′ and 8′ in a conventional manner.

Suitably secured to the upper rod or bar 4′ and in vertical alignment with bearing members and shafts 6 and 6′, 7 and 7′, 8 and 8′ are the journal bearing members 9, 10 and 11. These journal bearing members support the shafts 9′, 10′ and 11′. Disposed on shaft 9′ is a pair of spaced sheaves or grooved pulleys 13. Trained about these sheaves is a pair of endless pulley belts 12. These belts are further trained about sheaves (not shown) mounted on the shaft 10′ intermediate of and in an alternating fashion with three other sheaves 15, also disposed on the same shaft and in a manner similar to the lower mating belts 22 shown in FIGURE 4. Trained about the three sheaves 15 are three endless belts 16. Belts 16 are further trained about the sheaves 18, disposed on shaft 11′ in the same fashion as the lower mating belts 26 shown in FIGURE 4. Located below and in vertical alignment with the sheaves 13 is an additional pair of sheaves 21 about which are trained belts 22. Belts 22,

as indicated particularly in FIGURE 1, are also trained about the sheaves 23 mounted on shaft 7′ and interspersed between sheaves 25, the latter of which are disposed in vertical alignment with sheaves 15 mounted on the shaft 10′. Belts 26 trained about sheaves 25 are further trained about the sheaves 27 mounted on the shaft 8′. Endless belts 26 are trained about the lower sheaves 27 in the same manner as the endless belts 16 are trained about the upper sheaves 18 on shaft 11′. In other words, a series of cooperating upper and lower belts 12 and 16, 22 and 26 form carriers for engaging and transporting an open-ended container therebetween in a manner to be described more fully hereinafter.

A pair of sheaves (not shown) are also mounted on the shaft 11′ and interspersed with sheaves 18. Trained about this latter pair of sheaves is a pair of endless belts 30. Endless belts 30 are also trained about the sheaves 33 disposed at the exit end of the apparatus and journaled on the shaft 35. Also secured to shaft 35 is another pair of endless belts 36, belts 36 being disposed on opposite sides of belts 30. Belts 36 are first trained about the sheaves 38 mounted on shaft 35 and then about the sheaves 40 mounted on the shaft 42 secured to the journal bearing member 44. Bearing member 44 is secured by means of the brackets 45 to the one extremity of support rod 4′.

All of the aforesaid belts are driven from a central motor 50 suitably affixed by the bracket means 51 to one of the legs 2 of the apparatus. The shaft 51′ driven by motor 50 is provided with a main drive sheave or pulley 52 about which is trained the driving belt 53. Belt 53 is further trained about the main driving sheave 54 mounted on drive shaft 55. Shaft 55 is affixed to a suitable journal bearing member 55′ attached to the lower support rod 3 by bracket means 2′.

Also affixed to shaft 55 are the sheaves 57, 58 and 59. Trained about sheave 59 is one end of the endless belt 61. The other end of belt 61 is trained about the larger drive sheave 62 mounted on shaft 35. Thus, as the motor shaft 51 is rotated, it will in turn drive the sheaves 59 and 62 in a counterclockwise direction and a rotation of shaft 35 in a counterclockwise direction. Since shaft 35 is also provided with driving sheaves 33 and 38, it will cause counterclockwise rotation of the endless belts 30 and 36 and a similar movement of the driving sheave 68 affixed to shaft 42.

Shaft 55 also carries, as indicated above, the sheaves 57 and 58. Trained about sheave 57 is endless belt 73. This belt is also trained about the driving pulley or sheave 74 secured to the upper shaft 11′. Belt 75 trained about driving sheave 58 is also trained about the lower driving sheave 76 mounted on the lower shaft 8′. The designs of sheave 57 and sheave 74 on shaft 11′ are also such that they cause shaft 11′ to rotate at a higher rate than shaft 8′. This in turn will cause belts 12 and 16 to move faster than belts 22 and 26.

From the above it will be readily observed that as the motor 50 operates it will not only drive the various driving sheaves 54, 62 and 68 mentioned above in a counterclockwise direction, but also the driving sheave 74 for shaft 11′, and sheave 76 for shaft 8′, whereby upper belts 12, 16 and 30 will be motivated at the same time lower belts 22 and 26 are motivated. At the points where the belts 12 and 16, 22 and 26 contact a container C they will also be moving in opposite directions.

Means are also provided for synchronizing and regulating the rotational speeds of aligned shafts 7′ and 10′. These means comprise a sheave member 80 secured to the shaft 81. Shaft 81 is adjustably journaled to the lower support rod 3. Trained about sheave 80 is one end of an endless belt 82, while the other end of the endless belt is trained about upper and lower sheaves 83 and 84 secured

to shafts 10' and 7', respectively. Shaft 81 is also advantageously adjustably mounted on support rod 3 in a manner well known in the art so as to regulate the tension exerted by belt 82 on sheaves 83 and 84. The belts 12 are backed up by the spring biased roller assembly 90. The lower portions of belts 16 are backed up by the pivotally mounted and depending roller assemblies 92.

Roller assemblies 92 are mounted on shafts 92', which are pivotally secured to the brackets 93 affixed to platform or support 5 by means of the lever arms 94. Pivotally affixed to the upper portion of support 5 by means of lever arms 95 and bracket and journal means 95' is a shaft 96 upon which is mounted three tensioning sheaves or pulleys 97. These sheaves 97, of which only one is shown, engage the upper portion of belts 16. The sheaves 97 are spring biased by means of the coil spring assemblies 98 and spring anchoring means 99 there being a separate spring assembly 98 secured to each lever arm 95.

The lower series of belts 26, which are vertically aligned with and correspond to the upper series of belts 16, are backed up in the container or can spraying zone A—A by the series of supporting rollers 101, 102 and 103, suitably journaled on the roller support member 104. Support member 104 is adjustably mounted on the lower support rod 3 by bracket means 105. Dependingly and pivotally secured to the bottom of roller support 104 by means of pivot arms 106 and shafts 107 and 107' is a series of spring biased tensioning sheaves 108 which engage the lower portions of belts 26. Sheaves 108 are spring biased in a manner similar to sheaves 97 by means of spring assemblies 109 secured to each of the pivot arms 106 and the spring assembly anchoring units 110 affixed by brackets 111 to support bar 3. Disposed intermediate rollers 101, 102 and 103 are collection troughs 112. Troughs 112 which capture any over spray from the spray guns 113 are connected to a suitable suction type exhaust system 114.

From the above, it will be readily observed that as an open ended container C is successively introduced inbetween the upper and lower groups or series of belts 12 and 22, 16 and 26 with the upper series of successive belts 12 and 16 being rotated at a faster speed than the belts 22 and 26 and with the portions of belts 22 and 26 in contact with the container moving in an opposite direction to the portions of the belts 12 and 16 also in contact with the container, the container C will not only be rotated between the belts but at the same time it will be moved in a linear direction or to the right in the manner indicated particularly in FIGURE 3.

As the cans C are rotated by the upper and lower belt assemblies 12, 22, 16 and 26, they are caused to pass by one or more electrically energized spray guns 113 of which two are shown. As indicated in FIGURES 3 and 4, each spray gun 113 is disposed to one side of and adjacent the path of travel of a can C with the open end of the can or container C facing the nozzles 115 of the spray guns 113. The spray guns are adjustably mounted by suitable adjusting means 116 to the support 5.

Located across from each spray gun 113 and slightly offset with respect thereto is a proximity pickup device 117 of the type manufactured and sold by the Electro Products Laboratories, of Chicago, Illinois, and known as a proximity pickup Model No. 4955–RAC. The proximity pickup devices 117 are suspended by suitable insulated brackets 118 from support 5. Each proximity pickup device 117 operates to produce a magnetic field 124 about the pickup device. Each device 117 is also so constructed that upon a change in the magnetic field produced by the device as when an object approaches the proximity pickup device 117 a switching mechanism 125 will be energized in a manner to be more fully described hereinafter. Energization of the switching mechanism actuates the solenoid operated four-way valve or the like 123 of a spray gun 113. This produces an opening of the various lines to the spray gun whereby a jet of spraying or coating material will then be injected into the interior of a container or can C through the open mouth thereof, which at this time is in registry with a spray gun nozzle 115 as indicated in FIGURE 4.

As indicated schematically in FIGURE 5 each proximity pickup switching device 117 operates in the following manner. As a can C opproaches the magnetic field 124 set up by the proximity pickup device 117 it will cause the proximity switch 125 to be energized thereby closing the switch. Upon the closure of switch 125 current will be directed through the bridge rectifier 125', line 126, fixed resistor 127, variable resistor 128 and relay 129 in line 140 thereby energizing the relay. Energization of relay 129 causes actuation of valve 123 for a spray gun 113. This in turn permits an influx of coating material, etc., into the gun and the gun then injects this coating material through the open mouth of the can C into the interior thereof in such a fashion as the can rotates that a uniform coating of the interior surface or surfaces of the can is obtained. A condenser 130 may also be interposed in the circuit leading to the relay 129 for the purpose of reducing any chattering in the circuit during operation of the same. In addition to the pickup device 117, a hand operated switch 132 may also be disposed in the circuit as indicated in FIGURE 5 for the purpose of placing the valve 123 for the spray nozzle in an energizable condition during operation of the device. The switch 132 also acts as a safety mechanism at the time that the apparatus is not used.

As soon as a can C which is being rotated and moved in a linear path leaves the magnetic field 124 set up by the proximity pickup device 117 the proximity switch 125 will open thereby cutting out the relay 129 and deenergizing the solenoid operated valve 123. As noted above, by advantageously rotating a container C as the interior thereof is subjected to the action of one or more spray guns 113, a uniform overall coating of the various interior surfaces of the container will be obtained. After the spraying or coating operation each container is moved by belts 16 and 26 into contact with the overhead carrier belts 30 which then cause the coated containers to traverse the runout table 135 until the cans are discharged into a suitable collection hopper or other handling equipment. As indicated in FIGURE 1, belts 30 may also be advantageously engaged by a conventional backup roller assembly 136.

An advantageous embodiment of the invention has been herein disclosed and described. It is obvious that various changes and modifications may be made therein without departing from the spirit and scope thereof as defined by the appended claims wherein what is claimed is:

1. In a container coating device of the type described the combination of at least one pair of flat surfaced aligned and opposed endless belts so spaced from one another as to engage an open-ended container between the flat surfaces thereof, means driving the portions of said belts in contact with the container in opposite directions to each other and along predetermined linear paths, said means including means for moving one of said belts at a higher speed than the other belt whereby the container disposed between and engaged by the belts will be moved in a linear path while being simultaneously rotated, spray gun means disposed adjacent the path of travel of said belts and a container propelled thereby in such a fashion that it can project a coating into the interior of the container through the open end thereof, electromechanical means including a magnetic field producing means disposed adjacent said endless belts and spray gun means and adapted to activate and deactivate said spray gun means, said spray gun means being activated and deactivated by the container passing into and out of the magnetic field set up by said magnetic field producing means.

2. In a container coating device of the type described the combination of opposed flat surfaced endless belts

so spaced from each other as to engage an open-ended container between the flat surfaces thereof, means driving the portions of said opposed endless belts in contact with the container in opposite directions to each other and along predetermined linear paths, said driving means including means for moving one of said belts at a higher rate of speed than the other belt whereby the container disposed between and engaged by the belts will be moved in a linear direction while being simultaneously continuously rotated, spray nozzle means disposed to one side of said belts and adjacent the path of travel of the open-ended container engaged by the belts, said spray nozzle means also being disposed on the same side of said belts as the open-ended portion of the container so that it can project a coating into the interior of the container as the container passes the spray nozzle means, electromechanical means including a magnetic field producing means disposed adjacent said endless belts and spray nozzle means and adapted to activate and deactivate said nozzle means, said nozzle means being activated and deactivated by the container passing into and out of the magnetic field set up by said magnetic field producing means.

3. In an apparatus for coating the interior surfaces of open-ended containers the combination of flat surfaced opposed and spaced endless belt means for engaging an open-ended container between the flat surfaces thereof, means for driving the portions of each of said endless belt means in contact with the container in opposite directions and at different speeds with respect to each other whereby an open-ended container disposed therebetween will be propelled in a linear direction while being simultaneously rotated, at least one spray nozzle means disposed adjacent said belt means and the path of travel of the container engaged by said belt means, electromechanical means including a magnetic field producing means disposed adjacent said endless belts and spray nozzle means and adapted to activate and deactivate said nozzle means, said nozzle means being activated and deactivated by the container passing into and out of the magnetic field set up by the magnetic field producing means, whereby the nozzle means will project a coating through the open end of the container and into the interior thereof.

4. In an apparatus for both transferring an open-ended container from one station to another and for coating the interior of the container the combination of opposed and linearly disposed endless belts so spaced from each other as to engage a container open at one end therebetween, means for driving the portions of each of said endless belts in contact with the container at different speeds and in opposite directions to each other, whereby the container disposed between and engaged by the belts will be moved in a linear direction while being simultaneously continuously rotated, nozzle means disposed to one side of said belts and adjacent the path of travel of the container engaged by the belts, said nozzle means also being disposed on the same side of said belts as the open-ended portion of the container so as to

project a coating into the interior of the container, electromechanical means including a magnetic field producing means disposed adjacent said endless belts and spray nozzle means and adapted to activate and deactivate said nozzle means, said nozzle means being activated and deactivated by the container passing into and out of the magnetic field set up by said magnetic field producing means, and means for conveying the container to said endless belts, said last mentioned means being actuated by the endless belt driving means.

5. A device as set forth in claim 4 including means for withdrawing a coated container from between said endless belts, said last mentioned means also being actuated by said endless belt driving means.

6. In a container coating device the combination of a plurality of opposed groups of flat surfaced endless belts so spaced from each other as to engage between the flat surfaces thereof a container open at one end, means for driving said belts in a linear direction for a portion of their movements, said driving means including means for driving certain of the said belts in each group of belts at a higher speed than the belts in an opposing group of belts whereby the container disposed between and engaged by the said opposed groups of belts will be moved in a linear direction while being simultaneously and continuously rotated, nozzle means disposed to one side of said belts and adjacent the path of travel of the open-ended container, the disposition of said nozzle means also being such that the nozzle means can inject a coating into the interior of the container, electromechanical means including a magnetic field producing means disposed adjacent said endless belts and spray nozzle means and adapted to activate and deactivate said nozzle means, said nozzle means being activated and deactivated by the container passing into and out of the magnetic field set up by said magnetic field producing means, and other endless belts interspersed between the belts in the opposed groups of endless belts for feeding an uncoated container to said opposed groups of endless belts, and means connecting said other endless belts to the driving means for said opposed groups of endless belts.

7. A device as set forth in claim 6 including a plurality of endless belts for conveying an interiorly coated container away from the opposed groups of endless belts, and means including the said drive means for the opposed groups of endless belts for actuating said last mentioned endless belts.

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