United States Patent [19]

Gregory et al.

[11] **3,801,369**

[45] **Apr. 2, 1974**

[54] **METHOD FOR REMOVAL OF LITHOGRAPHY FROM CONTAINERS**

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[22] Filed: **Oct. 31, 1972**

[21] Appl. No.: **302,495**

[52] **U.S. Cl.** ..... **134/6,** 15/21 D, 15/70, 15/88, 101/425, 134/19, 134/33, 134/38

[51] **Int. Cl.** **B08b 1/02,** B08b 7/04

[58] **Field of Search** ..... 134/6, 19, 38, 5, 33; 15/21 D, 70, 88, 104.04; 101/425

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[57] **ABSTRACT**

The applied finish or lithography of cylindrical containers such as aerosol type containers is removed by passing the container through a zone of intense heat and then immediately into a second zone where the cylindrical surface of the container is brushed while hot and while the lithography is soft. A plurality of containers are preferably urged seriatim along a linear path through an induction heating coil and are then engaged by one or more wire brushes which rotate the container during the brushing operation. The process may be carried out rapidly and automatically without damage to the soldered seam or metallurgy of the container.

10 Claims, 7 Drawing Figures

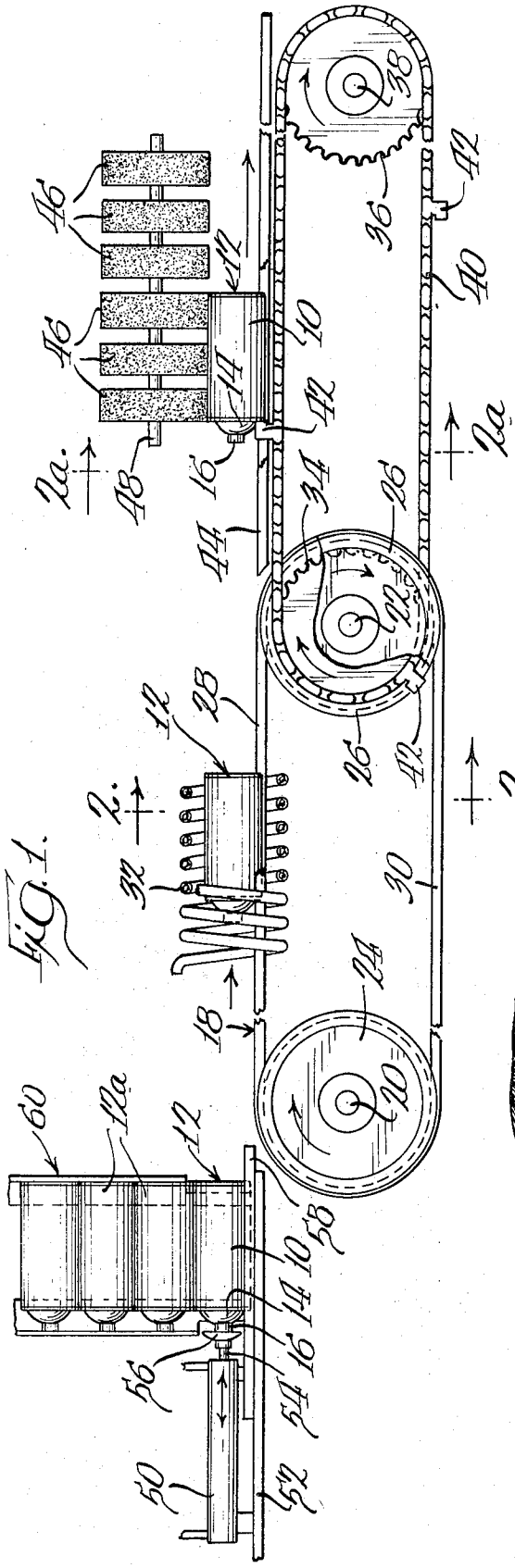


Fig. 1.

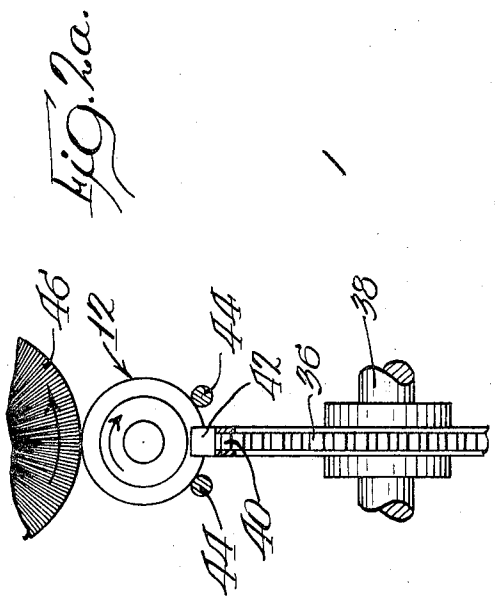


Fig. 2a.

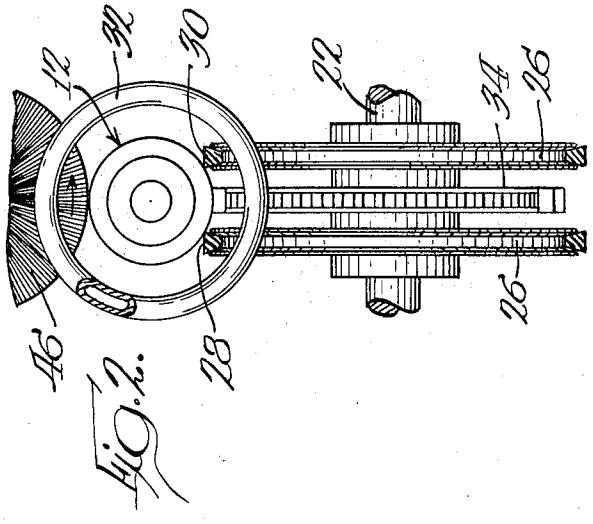


Fig. 2.

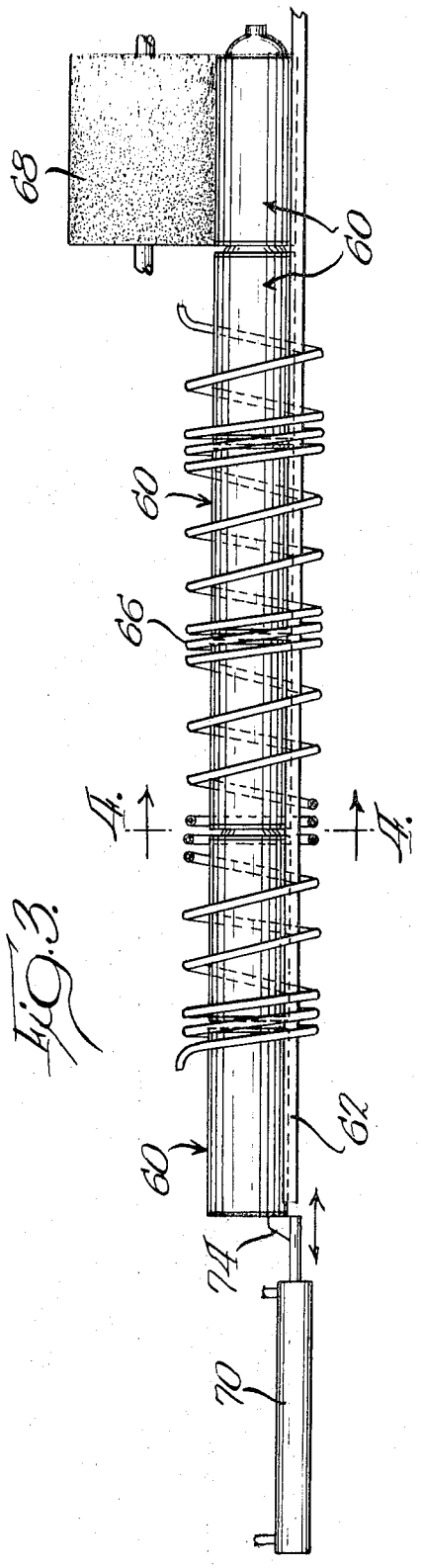


Fig. 3

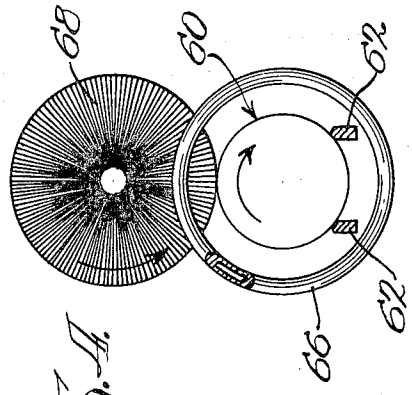


Fig. 4

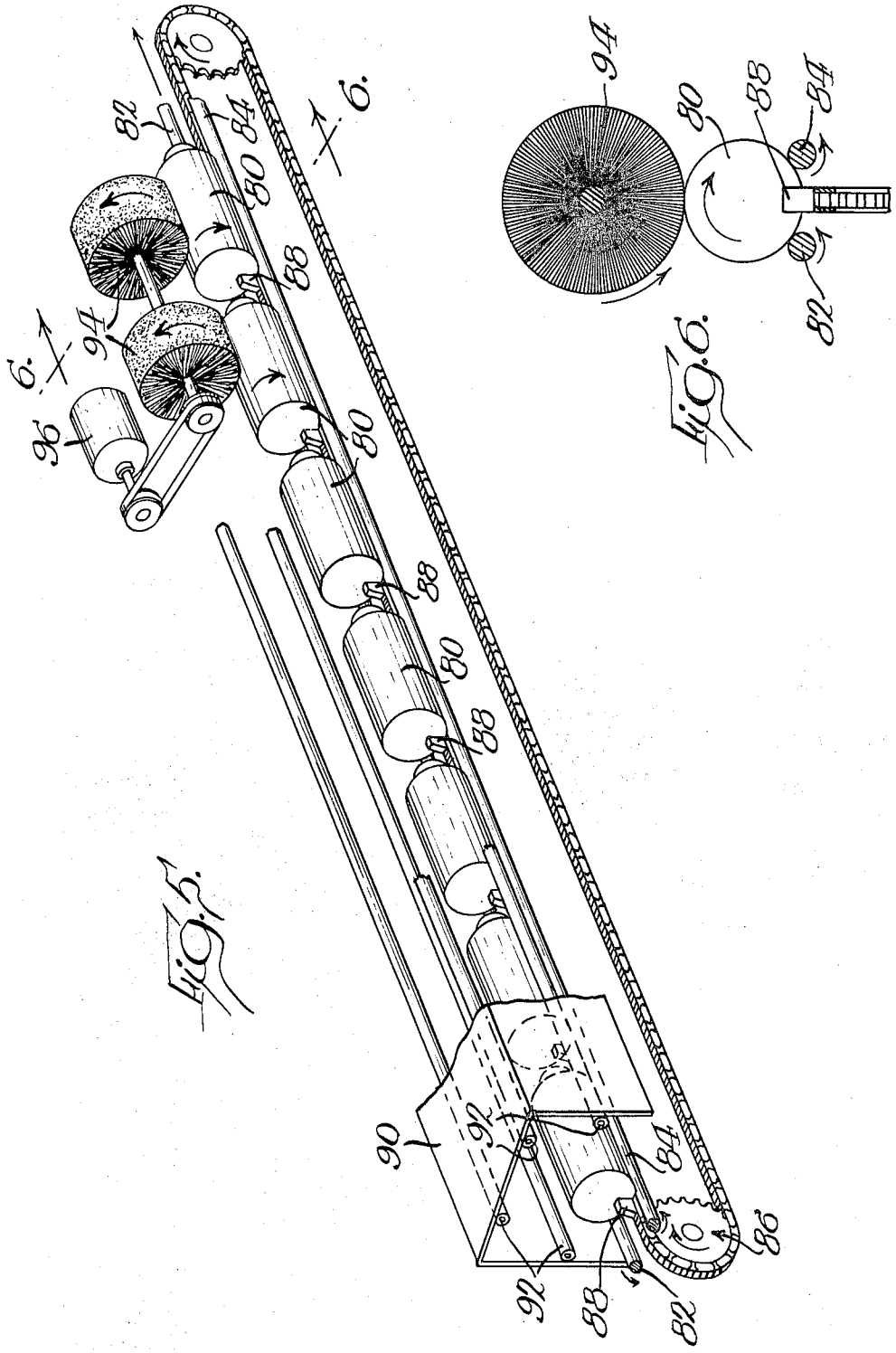


FIG. 5.

FIG. 6.

METHOD FOR REMOVAL OF LITHOGRAPHY FROM CONTAINERS

BACKGROUND OF THE INVENTION

Aerosol containers have gained wide acceptance for the storing and dispensing of a wide variety of products. Such containers are made of steel sheet to withstand considerable pressure and are usually cylindrical in shape, having a soldered axial seam along one side, and soldered seams joining the cylindrical wall to the top and bottom. The walls are plated or coated with tin to prevent rusting of the steel. The product under pressure within the container is dispensed by a valve arrangement usually located at the top of the container.

Aerosol and similar containers are normally provided with lithography in the form of a coating of paint, enamel, varnish or other suitable finish, which protects the metal surface from deterioration and contains printed information to identify the product. In most cases, lithography comprising the product name, description, instructions for use and other information or design is printed on the container surface in accordance with specifications provided by a particular customer, and the lithography is then covered by a clear varnish.

After the lithography has been applied, the container acquires a specific identity that is useful only to the customer for whom it was made, even though the container alone might be useful in other applications. Large scale production and misapplication of lithography often results in an excessive number of a given lot of containers that cannot be sold. Due to the high cost of containers of this type, it would be desirable to devise a method for completely removing the lithography to allow use of the container for another purpose.

In order to change the identity of the container, it is possible to apply a printed label or paper cover over the cylindrical surface, which hides the old lithography and allows use of the container for a different product. This procedure may be dangerous, however, because the label or cover is normally applied with minimal amounts of adhesive and is susceptible to removal. For example, if a container with hair spray or deodorant lithography was converted by application of a label to a paint spray container, and the label was later inadvertently removed, the container would become a dangerous instrument, viz., an unsuspecting consumer would use paint as hair spray or deodorant.

The use of solvents for the removal of lithography is not feasible because the varnishes used to overcoat the printing resins are of the silicone or epon type and resist most standard solvents. There are other drawbacks in the use of solvents, such as possible contamination of the interior of the container, disposal of waste solvent and lithography residue, health and safety hazards in the use of volatile solvents, and high solvent costs.

SUMMARY OF THE INVENTION

The present invention provides a method and apparatus for completely and inexpensively removing lithography from the cylindrical surface of a container, whereby the container may be used in another application without the possibility of confusion. The lithography is removed by first softening the lithography by rapid and uniform heating of the cylindrical surface, followed by brushing of the surface. The containers may then be used for any desired purpose by applying an appropriate label. The process allows for complete removal of the lithography without damage to the soldered seams or to the tin plating on the container.

The apparatus generally comprises a means for carrying or conveying the containers on their side through a heating zone, preferably through the coils of an induction heater, and means for passing each container between a rotating brush and a bearing support, whereby the containers are brushed while being rotated.

THE DRAWINGS

FIG. **1** is a simplified elevational view of the apparatus of the present invention, illustrating the various process steps of the invention;

FIG. **2** is a sectional view taken substantially along section line **2—2** of FIG. **1**;

FIG. **2***a* is a sectional view taken substantially along section line **2***a*—**2***a* of FIG. **1**;

FIG. **3** is a simplified elevational view of another embodiment of the present invention;

FIG. **4** is a sectional view through the apparatus of FIG. **3** taken along section line **4—4** thereof;

FIG. **5** is a simplified perspective view of a further embodiment of the present invention; and

FIG. **6** is a sectional view taken along section line **6—6** of FIG. **5.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiment of the invention is shown in FIGS. **1** and **2,** which illustrate an apparatus for removing lithography from the cylindrical surface **10** of an aerosol container **12** having the usual top dome **14** and valved outlet **16.** It will be appreciated, however, that the apparatus shown is capable of removing cured or hardened paint, enamel, varnish, and any other similar coating from a cylindrical object of any length.

The device generally comprises conveyor means for moving the cylindrical objects on their sides along a line, heating means for heating the surface of the object to soften the lithography thereon, and abrasion means engageable with the heated surface of the object to remove the softened lighography therefrom.

The conveyor means, generally indicated at **18,** preferably comprises a pair of spaced parallel shafts **20** and **22,** one of which is driven, with each shaft, respectively, having a pair of axially spaced pulleys **24** and **26** secured thereon. Respective pulleys **24** are aligned with the other pulleys **26** to mount a pair of spaced parallel belt loops **28** and **30,** which are stretched between their respective pulleys to define a substantially horizontal upper moving bed upon which the containers may be conveyed in a straight line on their cylindrical surface in a direction indicated by arrows in FIG. **1.** The belts **28** and **30,** which are composed of reinforced rubber or the like, are spaced apart a distance which is less than the diameter of the container **12,** such that the container is nested between the upper flights of the belts **28** and **30,** as shown in FIG. **2.**

The heating means is preferably in the form of a spiral induction coil **32** having a sufficiently large enough diameter to closely accommodate free passage of the belts **28** and **30** and the conveyed container **12** there-

through. The induction coil is conventional and comprises hollow copper tubing through which cool water is circulated, with the tubing being connected to a source of high frequency direct or alternating current. As the container passes through the coil on the belts, it is heated by means of eddy currents induced by the high frequency field surrounding the coil. The coil is of sufficient length and size to cause rapid and uniform heating of the entire container in a very short period of time, since the time residence of the container within the induction coil must be a fraction of a second to allow fast and efficient treatment of a large number of containers. In the embodiment shown in FIG. **1**, the coil **32** is preferably energized continuously while the containers are successively moved therethrough.

The temperature to which the container is heated is important and must be controlled by the length of the induction coil, the number of turns in the coil, the spacing between adjacent coil turns, as well as the speed of the conveyor. Generally, the maximum temperature reached by the container must be high enough to soften the surface coating but must be less than the melting point of the solder in the side joint commonly found in containers of this nature. Too high a temperature will cause leaks or structural failure in the container and may burn the container or melt the tin coating on the steel. Generally speaking, these conditions are attained if the containers are heated to a temperature of from about 340°F to 390°F, although temperatures of up to 450°F are possible with some types of containers.

The means for abrading the containers comprises a separate conveyor means cooperating with the first conveyor and one or more driven cylindrical brushes engageable with the cylindrical surface of the container.

As shown in FIGS. **1** and **2***a*, a sprocket **34** having a radius less than the pulleys **26** is rotatably mounted between said spaced pulleys on the exit end of the conveyor **18**, and a driven second sprocket **36** is mounted on a shaft **38** spaced from and parallel to the shaft **24**. The roller chain **40** having outwardly projecting spaced dogs or lugs **42** is wrapped around the sprockets and is driven thereby. In addition, a pair of spaced parallel fixed rods **44** extend substantially in the same plane as the upper flight of the conveyor **18** from the exit end thereof with the chain **40** located therebetween. The rods **44** are spaced apart for a distance less than the diameter of the containers **12** so as to support the containers during the brushing operation.

As the containers exit from the belt conveyor **18**, they are transferred to the rods **44** and are then engaged by a lug **42** of the chain **40**, said lug being of sufficient length to extend above the level of the rods and engage a shoulder of the can between the dome **14** and the cylindrical surface **10**. The lugs **42** serve to push the container along the rods **44** and into engagement with successive ones of a plurality of rotating brushes **46**, which may be mounted on a common shaft **48**.

The brushes **46** are preferably wire brushes, comprising a plurality of spaced disks to provide a series that is longer than the length of the container. Narrower brushes are preferred because they tend to conform better to the actual shape of the container and better accommodate dents which may be present in the surface of the container. Although high quality wire brushes having 0.006 inch diameter bristles are preferred, one sizes and materials, such as nylon, may be successfully employed. The shaft **48** is preferably adjustably spaced a sufficient distance directly above the chain **40** such that a moving container will be engaged between the rods **44** and successive brushes **46**. The axis of the shaft **48** is in the vertical plane of the container axes to hold the containers on the rods **44** without slippage to either side. As the containers are moved into engagement with the brushes **46**, the rotary motion of the brushes causes the containers to be rotated somewhat about their axes, thereby exposing the entire cylindrical surface of the container to brushing.

Although the containers may be conveyed through the apparatus in a contiguous relationship, it has been found preferable to convey the containers through the coil **32** in a slightly spaced relationship, i.e., at least about a one inch spacing, which increases the efficiency and uniformity of the heating process. When conveyed in a contiguous relationship, it has been found that the ends of the container are not sufficiently heated by the induction coil, and traces of lithography are not removed at the ends.

Means, as shown in the left hand portion of FIG. **1**, are provided for placing containers onto the belt conveyor in a timed, spaced relationship. A pusher, comprising a power cylinder **50** is mounted on a support **52** and includes an extendable and retractable rod **54** having an enlarged head **56** engageable with the crown **14** or valve **16** of a container **12**. A pair of spaced parallel rods **58** are mounted on the support **52** with the rod **54** and head **56** operating in parallel therebetween, said rods extending parallel to and in register with the top flight of the conveyor **18**. The rods **58** serve to support successive containers which are pushed off the rods and onto the conveyor **18** in a predetermined sequence.

The cylinder **50** is preferably activated at regular intervals by a suitable valve (not shown) to push successive containers **12** onto the conveyor **18**. A loading mechanism **60** comprises an inclined ramp or a sequence feed mechanism is connected to the support **52** in front of the rod head **56** and serves to load successive of a plurality of containers **12***a* onto the spaced rods **58**.

In operation, it may be seen that each container travels in substantially a straight line from the pusher to the heater and then to the brusher, and the containers travel in a spaced relationship with their domes **14** facing away from the direction of travel to assure proper engagement with the lugs **42**. The coil **32** is continuously energized, and as each container is passed through the coil, it is quickly heated, whereby the lithography on the cylindrical surface becomes soft. The heated container is then passed into the brushes **46**, which physically removes the lithography as the container is being pushed and rotated on the rods **44**. The containers may then be led away from the apparatus and may also be inverted and cleaned free of dust by a jet of pressurized air. Thereafter, the containers are rendered suitable for use by the application of a label on the cylindrical surface.

The version of the invention shown in FIGS. **3** and **4** allows the containers **60** to be cleaned in a contiguous fashion. A pair of spaced support members **62** and **64** extend through an induction coil **66** and beneath a brush assembly **68**. A power cylinder **70** equipped with a rod **72** having a pusher **74** is engageable with the bottom surface of successive containers introduced on

their sides onto the supports **62** by a suitable hopper or the like. The containers **60** are pushed axially in a contiguous fashion through the coil **66** to be heated and then through the brush assembly **68**, which serves to rotate and brush the hot containers free of lithography.

The coil **66** is arranged in a particular manner to assure that the contiguous containers are uniformly heated. For this purpose, the containers **50** are jogged on the supports **62** by the cylinder **70** into successive forward positions. The coil **66** has more closely spaced and additional turns in the zones corresponding to the ends of the containers than in the middle, such that additional heat is generated at the ends. The coil is long enough to accommodate at least two and preferably at least three containers at any given time, such that the containers are progressively heated by successive portions of the coils as they are indexed forward at fixed intervals and distances, with one container pushing the next successive container through the apparatus.

In the version shown in FIGS. **3** and **4**, the coil is not energized continuously but is pulsed in sequence with the container movement, or each time a container is advanced into a new position. In this manner, the containers gradually reach the desired temperature for lithography removal and are heated evenly, notwithstanding their contiguous relationship.

The embodiment shown in FIGS. **5** and **6** illustrate a different form of heating. The containers **80** are slidably conveyed on spaced parallel rods **82** and **84** from one end of the apparatus to the other by means of a chain drive **86** including spaced lugs **88** projecting from the chain and engaging and pushing the ends of the conveyors.

The initial portion of the rods **82** and **84** and chain drive **86** are surrounded or at least partially enclosed by a oven wall **90** having a plurality of electrical resistance heating elements **92** mounted therein, said elements being spaced from but substantially parallel to the rods **82** and **84**. The energization of the elements **92** serves to heat the interior of the chamber, thereby heating the containers as they pass therethrough.

As in the previous embodiments, the far end of the conveying line is equipped with suitable brushes **94** which are driven by a motor **96**. In the embodiment shown, the rods **82** and **84** are rotatable about their axes. As the brushes **94** engage the containers **80**, the rods **82** and **84** are rotated, thereby rotating the supported containers in the heating chamber to provide more uniform heating.

We claim:

1. A method for removing lithography from the cylindrical outer surfaces of containers in the absence of solvent contact comprising the steps of conveying the containers on their cylindrical surfaces along a path, and while being conveyed, heating the containers to a temperature sufficient to soften the covering of lithography upon the cylindrical surfaces thereof, and then brushing the cylindrical surfaces of the thus heated containers to effect lithography removal therefrom.

2. The method of claim **1** wherein the containers are heated by conveying them through an energized electrical induction coil.

3. The method of claim **2** wherein the containers are passed in a spaced relationship through a continuously energized induction coil.

4. The method of claim **2** wherein the containers are jogged through an induction coil and the coil is momentarily energized in sequence with each jog.

5. The method of claim **4** wherein the containers are jogged in a contiguous end to end relationship and the coil is arranged to effect more heating at the ends of the container than in the middle.

6. The method of claim **1** wherein the containers are heated by passage through a heated oven.

7. The method of claim **1** wherein the step of brushing comprises supporting the container on one portion of its cylindrical surface, and engaging another portion of the cylindrical surface with a rotating brush with sufficient force to cause the container to rotate about its axis.

8. The method of claim **1** wherein the containers are heated to a temperature of from about 340° to about 450°F.

9. A method of removing lithography from the cylindrical outer surface of an aerosol can in the absence of solvent contact comprising the steps of first heating the cylindrical surface to a temperature sufficient to substantially soften the lithography thereon, and then brushing said cylindrical surface to remove said lithography.

10. A method of removing lithography from the cylindrical outer surface of a container in the absence of solvent contact comprising the steps of supporting the container with its axis substantially horizontal, heating the container to a temperature of from about 340° to about 450°F, and then immediately brushing the heated cylindrical surface along an upwardly facing area thereof by a brush rotating on an axis substantially parallel to said substantially horizontal axis while the container rotates on a horozontal axis.

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