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METHOD FOR COATING AND TESTING COMPOSITE CONTAINERS

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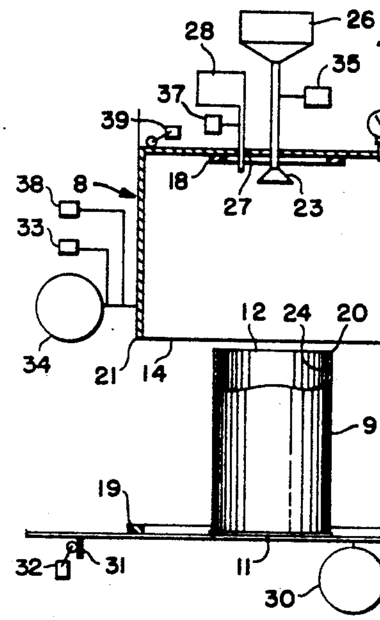

Fig. 1

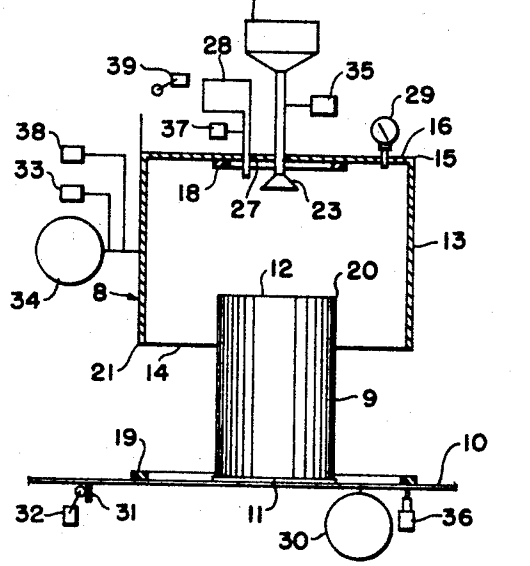

Fig. 2

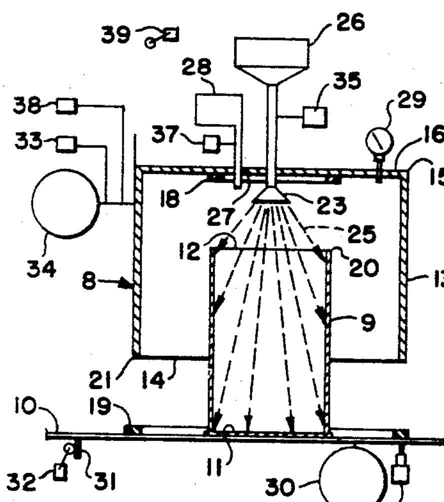

Fig. 3

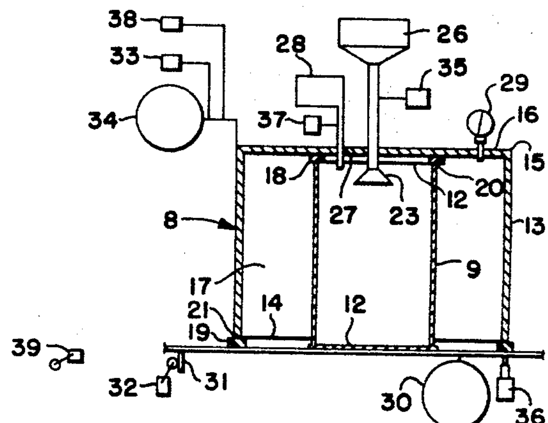

Fig. 4

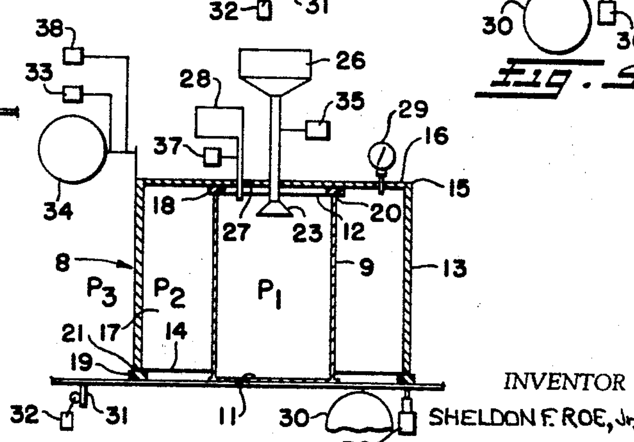

Fig. 5

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1

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METHOD FOR COATING AND TESTING COMPOSITE CONTAINERS

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ABSTRACT OF THE DISCLOSURE

A sprayable coating is applied to the interior of a container having a fluid previous wall and partially set. The container is closed and fluid pressure is applied to the interior thereof. The application of pressure tends to reduce pinholes and bubbles in the coating. Any loss of pressure indicates imperfections in the container or the coating thus making correction of the defect possible before the coating has been completely set. Suitable apparatus for operation of the method is also disclosed.

This invention relates to containers, and more particularly to a method and apparatus for coating and testing containers.

This invention is particularly well suited for providing organic inner linings in composite containers or cans, e.g. cans formed from laminated paper or cardboard, alone, or in conjunction with an outer metallic covering. Therefore, the following description of the invention will be given in relation to such containers.

Methods presently employed for coating and testing cans, require the following separate operations: First, the interior surfaces of the can body are coated by either spraying or immersing in a coating liquid; second, the coating is then dried either in an oven, or by allowing the coating to air dry; and third, the can is put under fluid pressure and tested for imperfections.

ADVANTAGES OF THIS INVENTION

This invention is an improvement over the prior methods, in that it combines the coating and testing operations. Unexpected results have been provided by combining these two operations. For example, the rate of producing finished composite cans has been substantially increased. Further, it has been found that fluid pressure coacting against the wet coating, drives the coating material further into the substrate of the can being coated, thus producing a highly improved coating, or inner lining in the can. Imperfections such as pinholes which develop in the coating, are oftentimes sealed when the coating is exposed to the pressure of fluid, e.g. gas such as air, during the testing operation. It has also been noted that the change in pressure affects the wet coating coming out of the machine and tends to reduce bubbling of the coating material. Another advantage in simultaneously spraying and testing the can, is that the can can be immediately resprayed and retested if imperfections are discovered, thus, substantially eliminating the number of rejected cans.

BRIEF STATEMENT OF INVENTION

Briefly stated, the invention is a method and apparatus for spraying the interior of a composite container with a synthetic resin, and immediately testing it while the sprayed coating or inner lining is still wet. In accordance herewith, there is provided an apparatus with a fluid impervious support on which a composite can is positioned. Also provided, is a hood, which is movable to and from the support for sealing coaction with the composite can, sealing the can's interior from the ambient

2

atmosphere. The hood is provided with a nozzle for spraying the interior of the composite can with the synthetic resin, as the hood moves into sealing engagement with the can. Means are provided for creating fluid pressure in the interior of the can and against its freshly sprayed walls when the hood is in sealing coaction with the can, to drive the wet coating into sealing contact with the can. Means are also provided for detecting a loss in the fluid pressure from the interior of the composite can to simultaneously test the can for leakage or imperfections.

The following description of the invention will be better understood by having reference to the annexed drawings wherein:

FIGS. 1–5 are diagrammatic illustrations of an embodiment of the apparatus for spraying and testing composite cans, and shows the sequential operation of the apparatus in coating and testing the composite cans.

DESCRIPTION OF THE INVENTION

Referring more particularly to FIGS. 1–5, there is shown an apparatus, generally indicated at **8**, for simultaneously spraying and testing a composite container or can **9**. The composite can **9** is placed either automatically, or by hand on a support **10**, which is, preferably, impervious to fluids, and can be in the form of a continuous conveyor belt either of the straight line or circular type. The composite can **9** is, preferably, cylindrical having its end **11** adjacent the support **10**, sealed. The other end **12** of the can **9**, is open. The support **10** is moved until the can **9** is opposite a hood **13**.

The hood **13** is mounted independent of the support **10**, for movement towards and away from the support **10**, and can be moved into abutting and sealing relation with the support **10**. The hood **13** is, preferably, cylindrical having a larger diameter than the cans to be sprayed and tested. The end **14** of the hood **13** closest the support **10**, is open. The hood's other end **15** is sealed by a disc **16**. The hood **13** is placed over the composite can **9**, in abutting and sealing relation with the support **10**. An annular space **17** is formed between the outer walls of the can **9**, and the inner walls of the hood **13**. The hood **13** surrounds the can **9**, and seals the interior and exterior of the can from each other, and from the ambient atmosphere.

The hood **13** and support **10** are provided with annular sealing rings **18** and **19**, for sealing engagement with the annular marginal edges **20** and **21**, respectively, of the can **9** and hood **13**. In this manner the interior and exterior of the can **9** are sealed from each other, and from the ambient atmosphere. The reason for this will become evident as the description proceeds.

The hood **13** is provided with a nozzle **23** for spraying the inner walls **24** and bottom **11** of the can **9** with a wet coating material **25**, e.g. a synthetic resin, as the hood **13** and nozzle **23** carried thereby, move towards the can **9** and support **10**(FIG. 3). The nozzle **23** is centrally disposed in the hood **13** having its axis coinciding with the longitudinal axis of the hood **13** and is effective to provide a atomized or non-atomized spray which provides a generally uniform coating. The nozzle **23** extends from the hood **13**, and communicates with any suitable means, generally indicated at **26**, for supplying the coating material **25**, under pressure, to the spray nozzle **23**, said means **26**, preferably, being mounted independent of the hood **13**.

An orifice **27** is provided in the hood **13**, and communicates with the interior of the composite can **9** when the hood **13** is in sealing coaction therewith (FIGS. 4 and 5). Any suitable means, generally indicated at **28**, for creating fluid pressure, communicates with the orifice

27, said means 28 also being, preferably, mounted independent of the hood 13.

PRESSURE TEST

When the hood 13 is in sealing engagement with the composite can 9, the initial pressure P_2 in the annular space 17 surrounding the composite can 9 is equal to the ambient atmosphere pressure P_3 outside the hood 13. The pressure P_1 within the interior of the composite can 9 is increased by applying fluid pressure through the orifice 27, and the applied pressure is held constant for a fixed period of time. A drop in the pressure P_1 and an increase in the pressure P_2, indicates a defect in the coating. The pressure decrease and increase of pressures P_1 and P_2, respectively, is recorded by any suitable recording device, e.g. pressure gauge 29 mounted on the hood 13 and communicating with the annular space 17 surrounding the exterior of the composite can 9 for recording any increase in the pressure P_2.

OPERATION

The following description is given in relation to a system for automatically controlling the operations of spraying and testing the composite container or can. In such system, the support 10 is in the form of a fluid impervious, continuous, rotary, conveyor belt. Any suitable means for positioning the composite cans 9 on the conveyor 10 may be utilized, e.g. by hand, or an automatically controlled machine not a part of this invention.

The conveyor belt 10 is rotated or driven by any suitable mechanism, e.g. motor 30, until the can 9 is positioned under the hood 13. Any suitable positioning mechanism can be used. For example, the conveyor belt 10 is provided with a lever 31 which contacts and activates a mechanism, e.g. switch 32, when the can 9 is properly positioned under the hood 13. The switch 32 controls operation of the motor 30, and when activated, stops the conveyor belt 10.

Further, switch 32 activates a mechanism, e.g. switch 33, for controlling a mechanism 34, e.g. a motor, for moving the hood 13 into sealing engagement with the conveyor belt 10 and can 9. The switch 32 also activates a mechanism such as a timer 35, for controlling the operation of the mechanism 26 which supplies the synthetic resin 25, under pressure, to the nozzle 23. The timer 35 automatically initiates and controls the length of the spraying operation. The hood 13 when it sealingly engages the conveyor belt 10, operates a mechanism such as a pressure switch 36, for activating the switch 33 to shut off the hood moving motor 34.

The pressure switch 36 also activates a mechanism such as a timing device 37, which, in turn, controls the mechanism 28 for creating fluid pressure within the composite can 9. The timer 37 also controls the interval of time during which, the wet coating is tested for any imperfections, such defects as pinholes, etc., being noted by observing on the gauge 29, a change in fluid pressure between the interior and exterior of the can 9. After the time for making the pressure test has lapsed, the timing mechanism 37 activates a mechanism, e.g. switch 38, which controls the operation of the motor 34 to move the hood 13, out of sealing engagement with the conveyor belt 10 and composite can 9.

At this point, if an imperfection in the coating is noticed, the operation of the remaining cycles can be automatically cut out, or by-passed, and the can resprayed and retested as previously described. If no imperfections are found, the hood 13 after it moves away from the conveying belt 10 a predetermined distance, activates a mechanism, e.g. switch 39, which, in turn, activates the switch 38 to shut off the motor 34. The switch 39 also activates the switch 32 which controls operation of the motor 30. The motor is started and moves the conveyor belt 10. The conveyor belt 10 moves until the next succeeding lever, similar to lever 31, contacts the switch 32 to shut off the motor 30, controlling the movement of the conveyor belt 10, and positions the next succeeding can in axially aligned relation to the hood 13. The coating and testing operations are then repeated for this and each succeeding container.

ORGANIC LINING MATERIAL

The composite cans can be coated with substantially any sprayable coating. The following synthetic resins have been found suitable and are illustrative: alkyd coatings, epoxy coatings, polyester coatings, acrylic latices, polyvinyldene chloride in a suitable solvent, polyvinyldene chloride latex, polyethylene dispersions, polypropylene dispersions, poly(vinyl chloride) coatings, polyolefins and butadiene-styrene latices. It has been found that polyvinyldene chloride and polyolefins produce the best results. Hot melt-type coatings such as polyamides, waxes, or ethylene-vinyl acetates are also advantageous. Where these hot melt-type coatings are used, it is desirable that the mechanism 26 for supplying the coating material 25 under pressure to the spray nozzle 23, be heated.

FORMATION OF COMPOSITE CAN

The containers or cans utilized in this invention are formed from laminates of paper, cardboard, etc., for example, two layers of sixty-pound kraft paper. The paper and glue structure is susceptible to being destroyed when subjected to the coating solvent. To prevent this, the solvent (water in latex, or methyl ethyl ketone in a solution) must be evaporated before the solvent penetrates too far into the container wall. This can be accomplished by immediately drying the coating with a high velocity stream of hot air after the composite can has been tested. Also, the adhesive used to bond the two layers of sixty-pound kraft paper should be resistant to the solvent of the coating material, for example, animal glue can be satisfactorily used with a coating of polyvinyldene chloride latex.

OTHER ADVANTAGES

Other advantages apparent from using the above-described process for coating composite cans with synthetic resins are:

(1) The interior spiral seams and end seams resulting when forming the composite can, are covered with coating material giving superior leakage resistance.

(2) The most important closed end of the can as in paint containers, is protected from corrosion by the contents, for example, latex house paints will corrode an aluminum paint bucket.

(3) The coated composite container should be relatively cheap to manufacture because all that is necessary for the container function is the latex adhesive plus, for example, the two adhesively-bonded paper layers of sixty-pound kraft paper.

(4) Structural properties such as stiffness can be added to the container, especially, if the solvent penetrates into the paper, e.g. polystyrene dissolved in methyl ethyl ketone and used as a coating on the inside of the composite can could add considerably to the stiffness. It would be extremely difficult to impregnate the paper with polystyrene before spirally winding and forming the composite can, as polystyrene is a brittle material and might prove too brittle or stiff to wind on a high speed production basis.

Thus, there has been provided a new and novel method and apparatus for simultaneously coating the interior of a composite can and pressure testing the coated can, this method producing many advantages which are not found in the methods or processes presently employed.

What is claimed is:

1. In a process for producing composite containers

having their interior surfaces coated with a lining material, the steps of:

providing a composite container having a fluid pervious wall and an open end;

applying a wet coating of lining material having a volatile ingredient into the open end of the container to coat the interior of the container;

closing the open end of the container;

partially setting the coating of material by removing part of a volatile ingredient in the lining material to render it pliably adhesive; and

applying fluid pressure to the interior of the closed container to force the pliably adhesive material into intimate, sealing engagement with the interior surfaces of the container.

2. In a process for producing composite containers having their interior surfaces coated with a lining material, the steps of:

providing a composite container having an absorbent wall and an open end;

spraying a coating of lining material into the open end of the container to coat the interior surfaces thereof, the lining material containing a volatile ingredient;

sealing the exterior and interior of the container from each other, and the ambient atmosphere;

partially setting the lining material by removing part of the volatile ingredient in the coating material to render it pliably adhesive,

applying fluid pressure to the interior of the closed container to force the pliably adhesive lining material into intimate, sealing engagement with the interior surfaces of the container; and

recording the fluid pressure to detect any loss of pressure from the container, for testing the container for leakage.

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DAVID KLEIN, *Primary Examiner.*

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73—49.2; 93—77; 117—96; 118—9, 50