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Kreutzer

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[54] **FLOW-COATING APPARATUS**

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[51] **Int. Cl.** **B05b 13/06**

[58] **Field of Search** 118/2, 326, 324, 7, 8, 118/636, 306, 317

[56] **References Cited**

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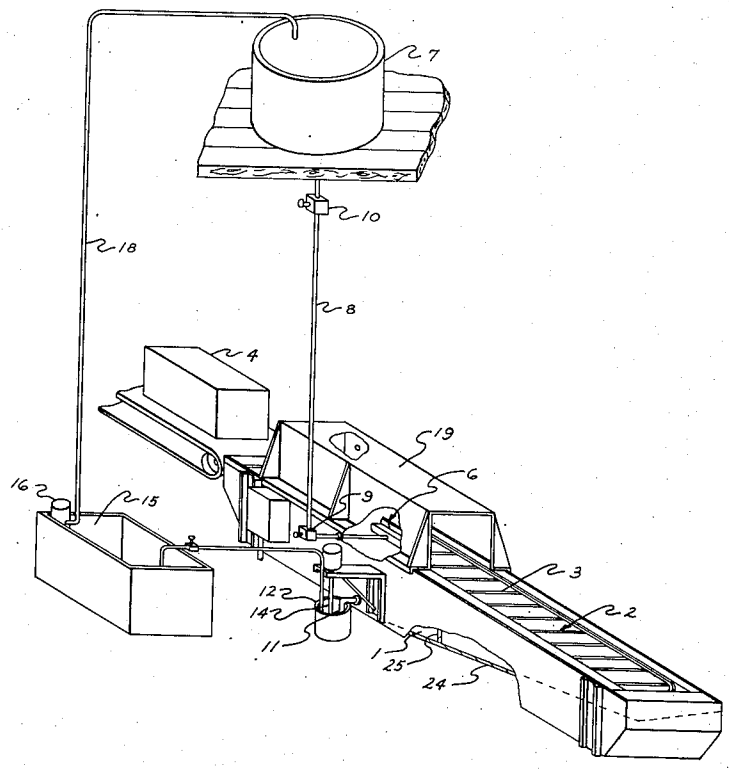
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[57] **ABSTRACT**

Flow-coating apparatus comprising an open conveyor means for conveying an article to be coated over a gravity-fed spray nozzle positioned below the conveyor and above a sump for collecting the coating material issuing from the nozzle. The nozzle is designed to provide a continuous spray pattern of an elevation such that it extends upwardly through the conveyor means for contacting the article. A deflector is provided for intercepting the sprayed material before it passes through the conveyor and directing it into the sump except during those periods when the article to be coated is within the spray pattern.

4 Claims, 2 Drawing Figures



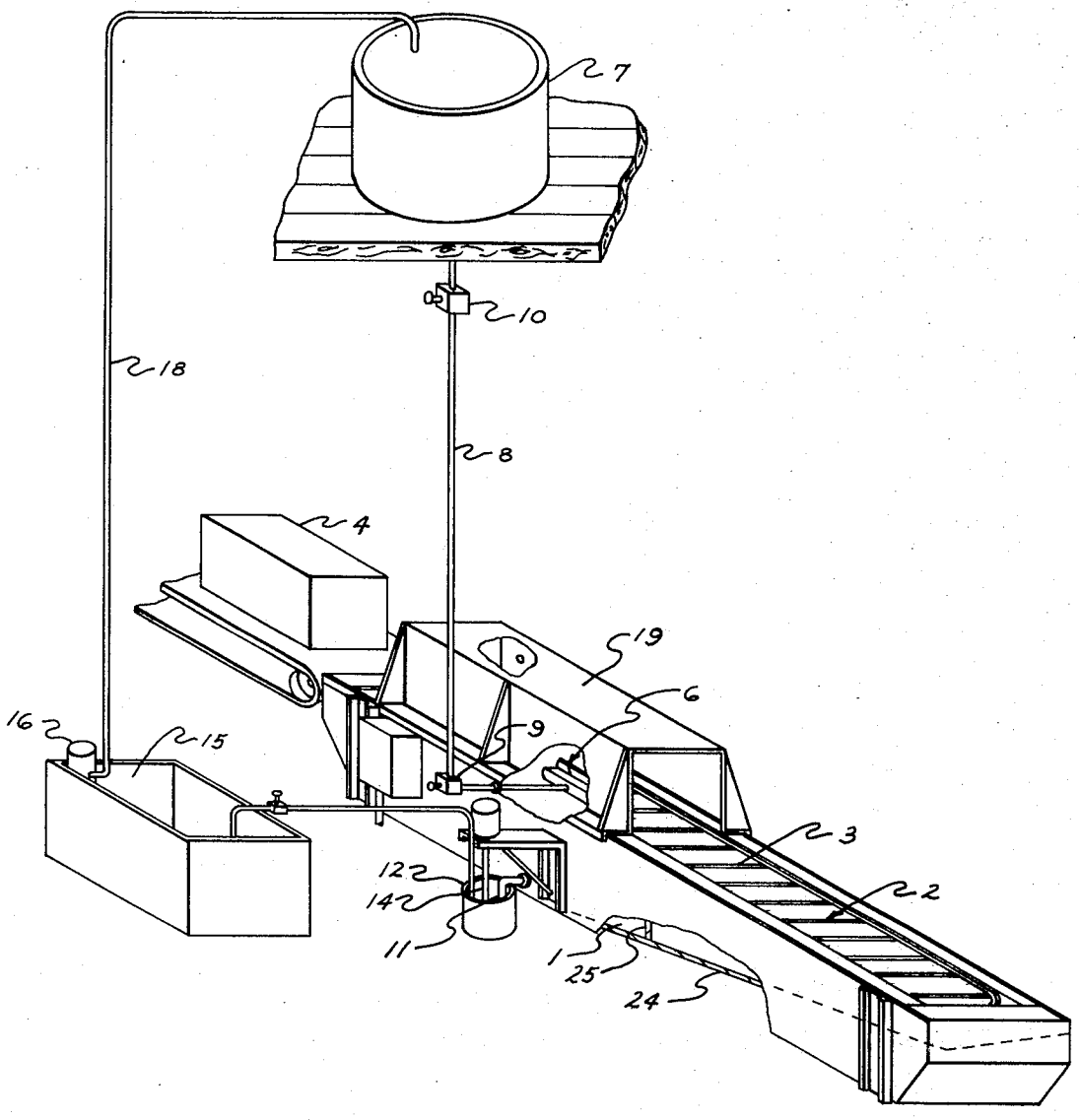


FIG. 1

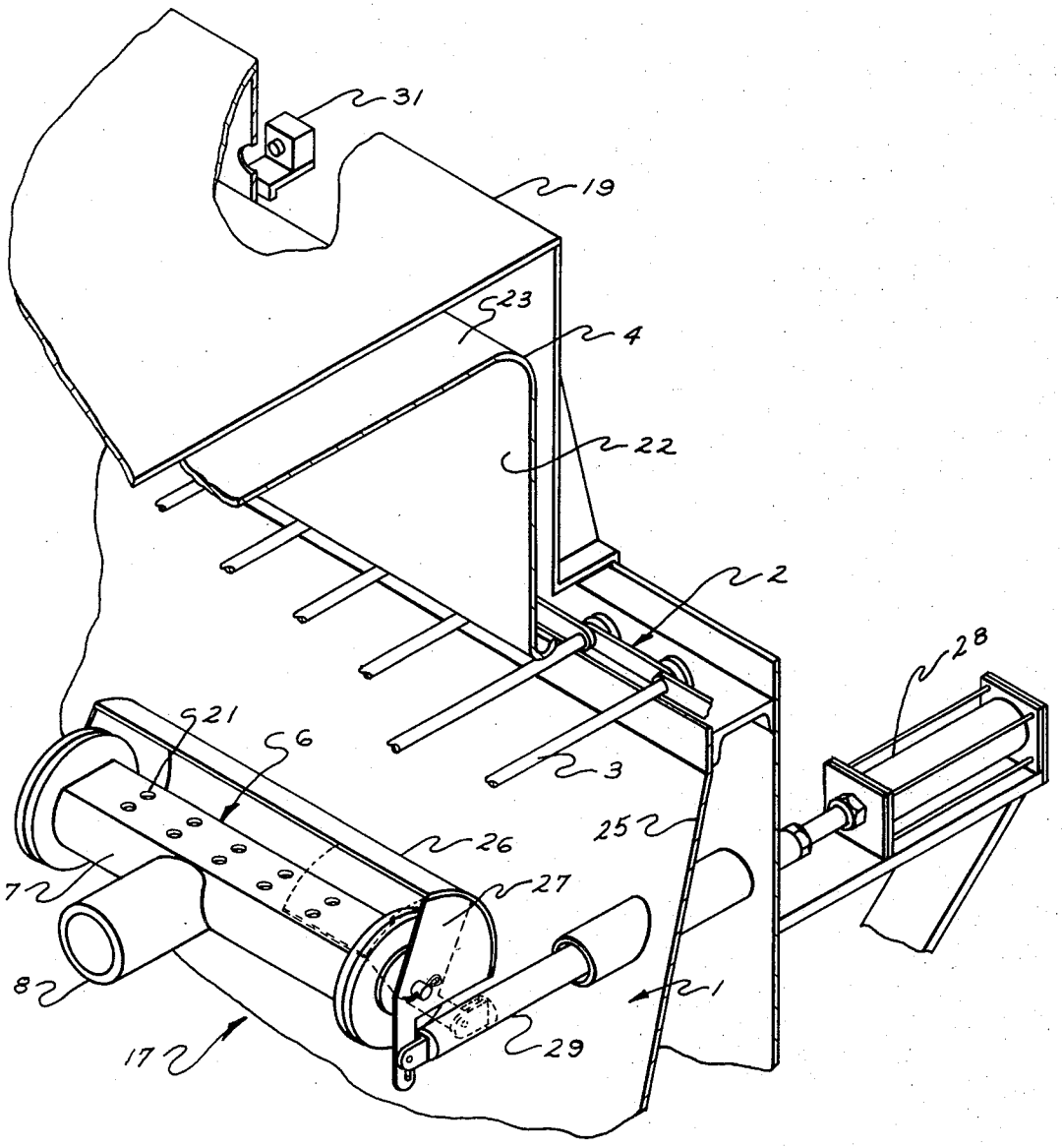


FIG. 2

FLOW-COATING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates particularly to the flow coating of porcelain enamel slip onto a surface of a moving article. The flow-coating technique for applying a coating material to an article surface broadly comprises the application to the surface of the coating material an amount far in excess of that which will adhere to the surface and allowing the excess to drain from the surface prior to the drying or curing of the applied coating. In the coating of small articles, it has been a common practice to dip the articles into a bath of the coating material, for example an aqueous porcelain enamel slip, and allow the excess material to drain from the article prior to firing of the enamel coat. In the coating of larger articles, such as a refrigerator cabinet liner, the dipping process has a number of disadvantages. A particular disadvantage is the size of the tank which is required for the application of the coating material by the dipping process. Accordingly larger parts, particularly when it has been desired to limit the application of the coating materials to selected surfaces, as for example the inner surfaces of a refrigerator liner, have been coated either by using a pressurized spray gun or by the use of manually controlled or automaticaly controlled gravity-fed spray means using the flow-coating technique.

Previously known flow-coating apparatus for coating relatively large articles has included a gravity-fed spray nozzle providing a low-pressure spray pattern for applying the coating material to a given surface, means for conveying the articles over the spray nozzle and valve means in the nozzle supply line for providing a flow of coating material from the nozzle during the time that a moving article is positioned to receive the spray coating and to turn off or discontinue the flow to the nozzle between articles. This type of apparatus has had a particular disadvantage in its use for the application of aqueous porcelain enamel slips. With the intermittent fluid flow, the nozzles tended to plug or stop-up due to the on-off operation and, with the low-head pressure of the gravity feed, problems are encountered due to the time delay in the building up of the spray pattern to the proper height required to engage the entire surface to be coated as that surface is moved into coating position.

The present invention has as its general object the provision of a flow-coating apparatus which is not subject to either of these and other disadvantages of previously known flow-coating apparatus.

SUMMARY OF THE INVENTION

In accordance with the illustrated embodiment of the present invention, there is provided an automatic flow-coating apparatus for flow coating an article surface comprising a spray manifold including a plurality of nozzles adapted to provide a continuous upwardly-directed spray of coating material, a coating material reservoir positioned above the manifold for gravity feeding coating material to the manifold, a sump below the manifold for collecting coating material flowing from the manifold and pump means for returning the material from the sump to the reservoir. The spray material flows from the nozzle continuously and conveyor means are provided for supporting and moving an article over the manifold and through the spray pattern. Deflector means are provided in association with the manifold, the deflector means being movable from a first position in the path of the material flowing upwardly from the nozzles and the second position out of that path. Thus, the deflector means is adapted to prevent spraying of the coating material upwardly through the conveyor means whenever an article is not in a position to receive the spray, and means responsive to the positioning of the article are provided for controlling the deflector means to permit free spraying of the material only during the time that an article is in a position to be coated thereby.

BRIEF DESCRIPTION OF THE DRAWING

With reference to the accompanying drawing:

FIG. **1** is a general perspective view of the apparatus of the present invention; and

FIG. **2** is a detailed and enlarged perspective view of the manifold and associated portions of the apparatus of FIG. **1**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While the apparatus of the present invention can be employed for coating selected surfaces of a wide variety of articles, it will be particularly described with reference to the flow coating of porcelain enamel slip onto the interior surface of a refrigerator liner, that is an openfaced, box-like structure.

With reference to FIG. **1**, the apparatus comprises an open-top, relatively long sump or receptacle **1** and a chain conveyor **2** including a plurality of transversely extending rods **3** for supporting and conveying the article to be coated, such as a refrigerator liner **4**, across the sump **1**, more specifically, from one end of the sump to the other. A spray manifold generally indicated by the numeral **6** is positioned centrally of the sump and below the conveyor **2** and is adapted, as will be more fully described hereinafter, to provide an upwardly-directed spray pattern of a shape such that the entire interior surface of the refrigertor liner **4** will be contacted by material sprayed from the manifold.

Coating material is supplied to the manifold **6** under gravity pressure from a reservoir **7** elevated above the manifold and connected thereto by a conduit **8** including a control valve **9** for controlling the quantity flow of coating material to the manifold **6** and a shut-off valve **10**.

In accordance with the usual flow-coating practice, the amount of material sprayed from the manifold **9** is far in excess of the amount required to apply an adhering coating to the surface to be coated. This excess material which falls into the sump **1** flows therefrom through a drain pipe **11** into a container **12** from which it is pumped by means of a pump **14** into a mixing tank **15** which can be employed to make up additional batches of coating material or to control the composition of the coating material. From the tank **15** a pump **16**, the operation of which may be controlled by the level of material contained in the reservoir **7**, pumps the excess coating material through a conduit **18** to the reservoir **7**.

A hood **19** forms a tunnel above the manifold **6** for preventing splashing or spraying of the coating material issuing from the manifold onto the surrounding area,

the hood 19 being sufficiently large to accommodate the article being coated.

The manifold structure of the present invention is shown particularly in detail in FIG. 2 of the drawing. It comprises a tubular or cylindrical body member 7 which extends transversely of the sump 1 below the hood 19 and which includes a plurality of nozzles 21 in its upper surface arranged to provide a dispersed spray of coating material upwardly in a pattern which will bathe all of the interior surfaces 22 of the liner 4 with coating material, this spray comprising low-velocity streams issuing from the nozzles under the pressure provided by gravity flow of the coating material from the reservoir 7.

In use of the apparatus, the valves are set so that there is a continuous flow of coating material from the nozzles 21 during operation of the apparatus. The control valve 9 is set to provide a spray comprising streams of coating material passing upwardly between the rods 3 of the conveyor 2 at least to the height or elevation necessary to contact the most remote wall 23 of the liner 4. The excess material reaching the liner surfaces flows back into the sump 1 which, as indicated in both FIGS. 1 and 2 of the drawing, includes a sloping bottom wall 24 and slanting side walls 25. The excess coating material flows downwardly along these walls to the lower portion of the sump from which it is drained through the conduit 11.

In order to interrupt the spraying of the coating material upwardly through the conveyor during the time that an article is not in a position to receive the spray material, there is provided in accordance with the present invention a deflector plate 26 of a generally arcuate configuration, this deflector plate extending the full width of the nozzle area of the manifold 6 below the conveyor and being pivotally supported by arms 27 on the opposite ends of the manifold. A hydraulic cylinder drive means generally indicated by the numeral 28 is connected through a drive rod 29 to one of the arms 27 for movement of the deflector plate 26 between a solid-line position as illustrated in FIG. 2 of the drawing in which it is to one side of the cylinder 7 or, in other words, out of the spray pattern, to the dotted-line position in which it overlies the nozzles 21. In this position, it intercepts the upward flow of coating material from the nozzles 21 and deflects that coating material back into the sump 1.

For the purpose of automatically controlling the operation of the deflector plate 26, there is provided a sensing means including an electric eye 31 sensing the entrance of a liner 4 into the spray receiving position for operating the hydraulic cylinder 28. As the article 4, moved laterally by the conveyor 2, moves into a position to receive coating material from the manifold 6, the deflector is moved to the solid-line position thereby permitting the material flowing from the nozzles 21 to assume a spray pattern extending upwardly through the conveyor 2 into coating engagement with the interior surfaces of the liner 4. The control mechanism operated by the electric eye 31 also interrupts the flow of the spray from the manifold 6 at the time at which the trailing end of a liner 4 leaves the spray area.

It will be understood, of course, that the nozzles 21 are adjusted so that only the selected surfaces, for example the interior surfaces, of the liner are sprayed. This results in a significant savings in coating material. Within limits, the apparatus may also be used to handle various sizes, shapes and heights of liners since the spray pattern as it passes upwardly through the conveyor and into the liner is well within the dimensions of the opening to the smallest of the various liners.

It has been found that the apparatus of the present invention is a much more efficient and less expensive method of applying vitreous enamel to the interior liners or the like than the usual spraying apparatus. Evaporation of the liquid from the coating material and hence an increase in the viscosity thereof is reduced by the interruption of formation of the full spray pattern and exposure of the individual streams to the ambient atmosphere during the "non-coating" periods. Also, since the material is flowing continuously and the coating operation is interrupted only by the deflector plate 26, the use of an on-off liquid flow control valve and the erosion of the valve components by the spray material are eliminated.

While there has been shown and described a specific embodiment of the present invention, it will be understood that it is not limited thereto and it is intended by the appended claims to cover all such modifications as fall within the true spirit and scope of the present invention.

I claim:

1. An automatic flow-coating apparatus for flow coating a surface of an article with a coating material comprising:

a spray manifold including a plurality of nozzles for providing a continuous upwardly-directed spray of coating material supplied to said nozzle;

a coating material reservoir positioned above said manifold for gravity feeding coating material to said manifold;

a sump below said manifold for collecting coating material flowing from said manifold and means for returning material from said sump to said reservoir;

conveyor means for supporting an article for movement over said manifold and through the sprayed material;

and deflector means movable between a first position and the path of said material flowing from said nozzles and a second position out of the path; and

means responsive to the positioning of said article in a position to be contacted by the sprayed material for moving said deflector means to said second position.

2. Apparatus according to claim 1 in which said manifold comprises a cylindrical body including said nozzles and said deflector means is an arcuate plate pivotally supported on the ends of said cylindrical body.

3. An automic flow-coating apparatus for flow coating a surface of an article with a coating material comprising:

a spray manifold including a horizontally disposed cylindrical body having a plurality of nozzles in the upper surface thereof for providing a plurality of upwardly directed streams forming a spray of the material supplied to said nozzle;

a coating material reservoir positioned above said manifold for gravity feeding coating material to said manifold;

a sump below said manifold for collecting coating material flowing from said manifold and means for returning material from said sump to said reservoir;

conveyor means for supporting an article for movement over said manifold and through the sprayed material; and a deflector plate below said conveyor means and movable between a first position in the path of said material flowing from said nozzles and a second position out of the path; and

means responsive to the movement of said article into a position to be contacted by the sprayed material for moving said deflector plate to said second position.

4. Apparatus according to claim **3** in which said deflector plate is of arcuate shape and is pivotally supported on the ends of said cylindrical body.

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