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BOTTLE COATING

Filed Oct. 12, 1971 5 Sheets-Sheet 1

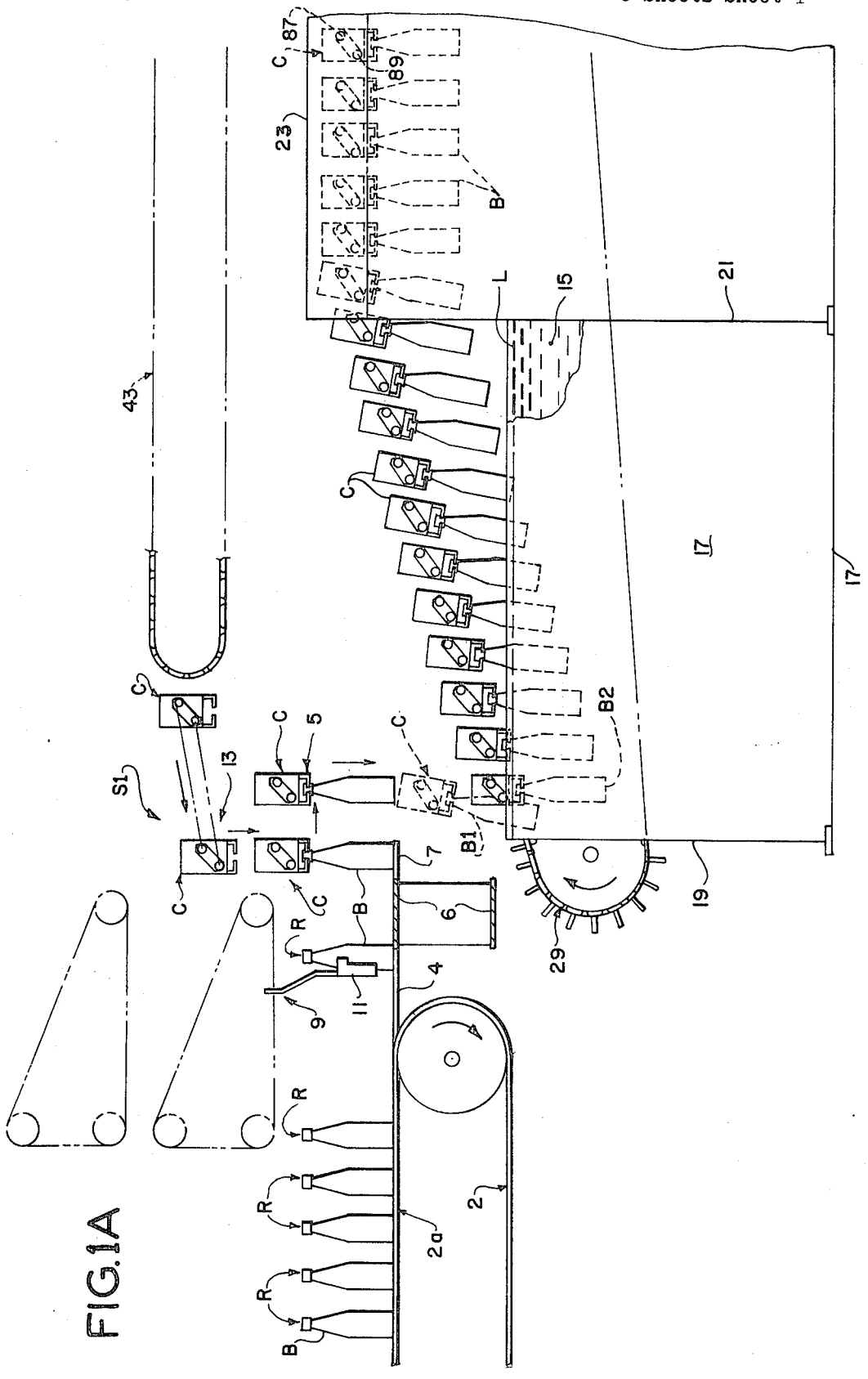

FIG. 1A

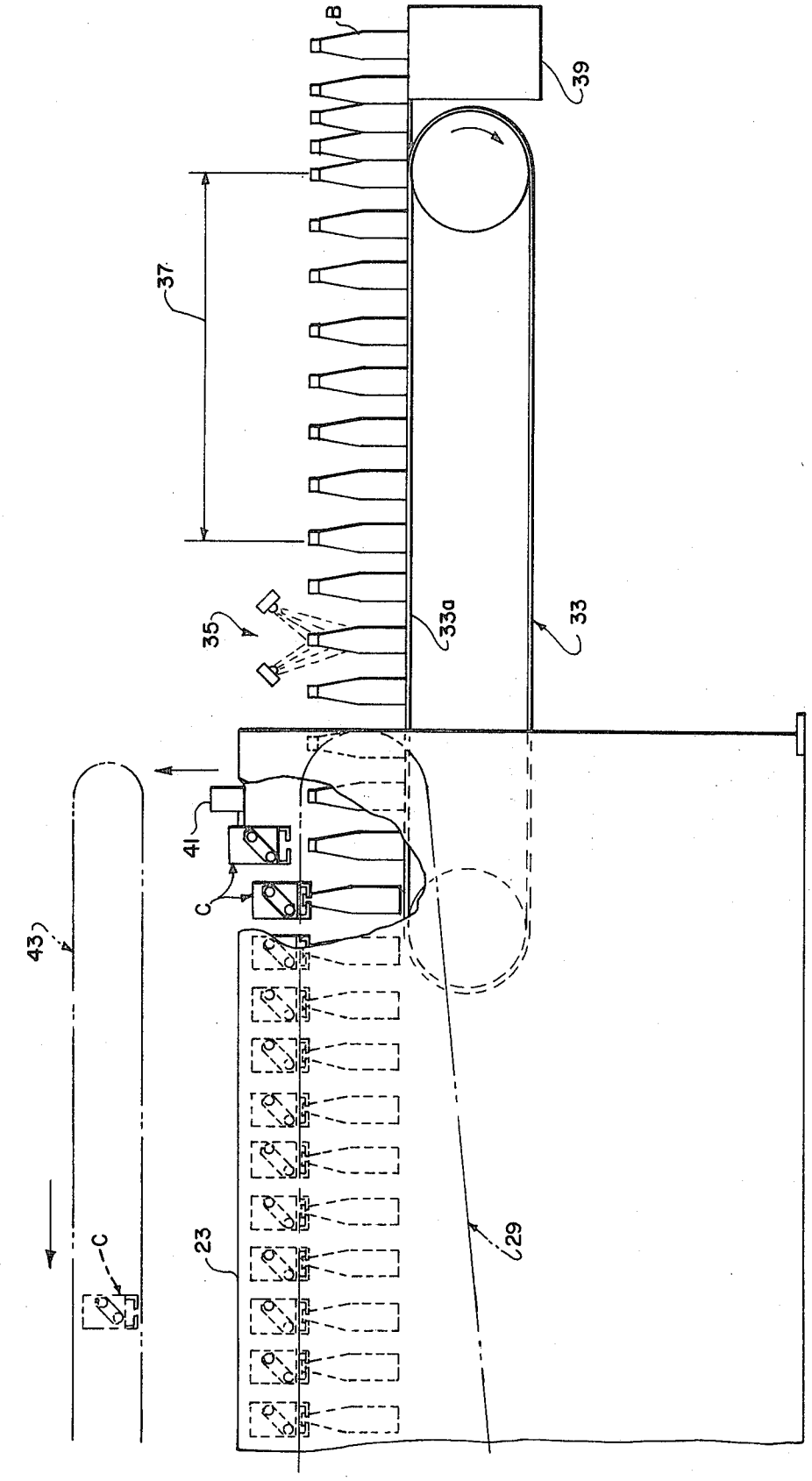

FIG.1B

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FIG. 2

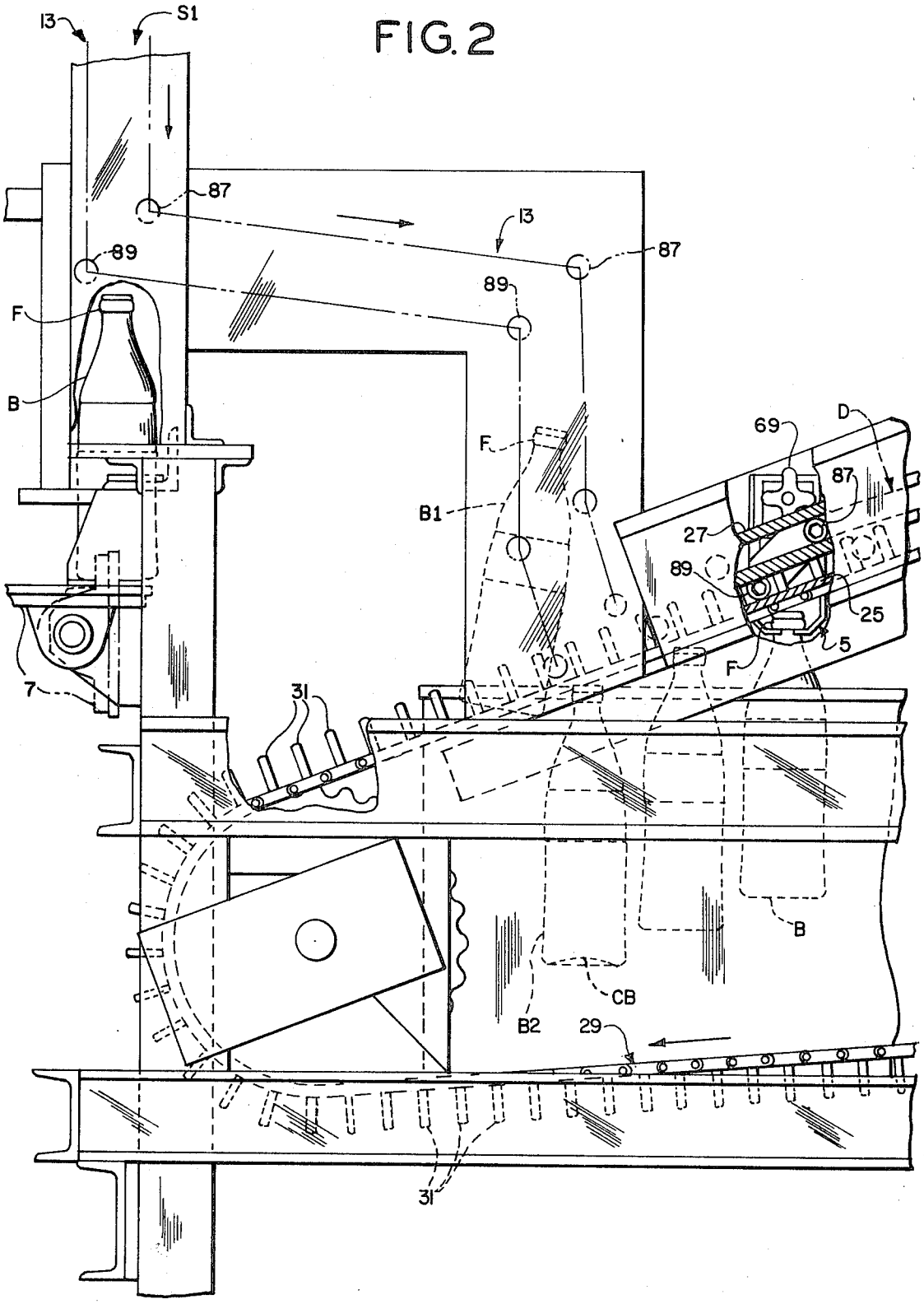

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FIG. 3

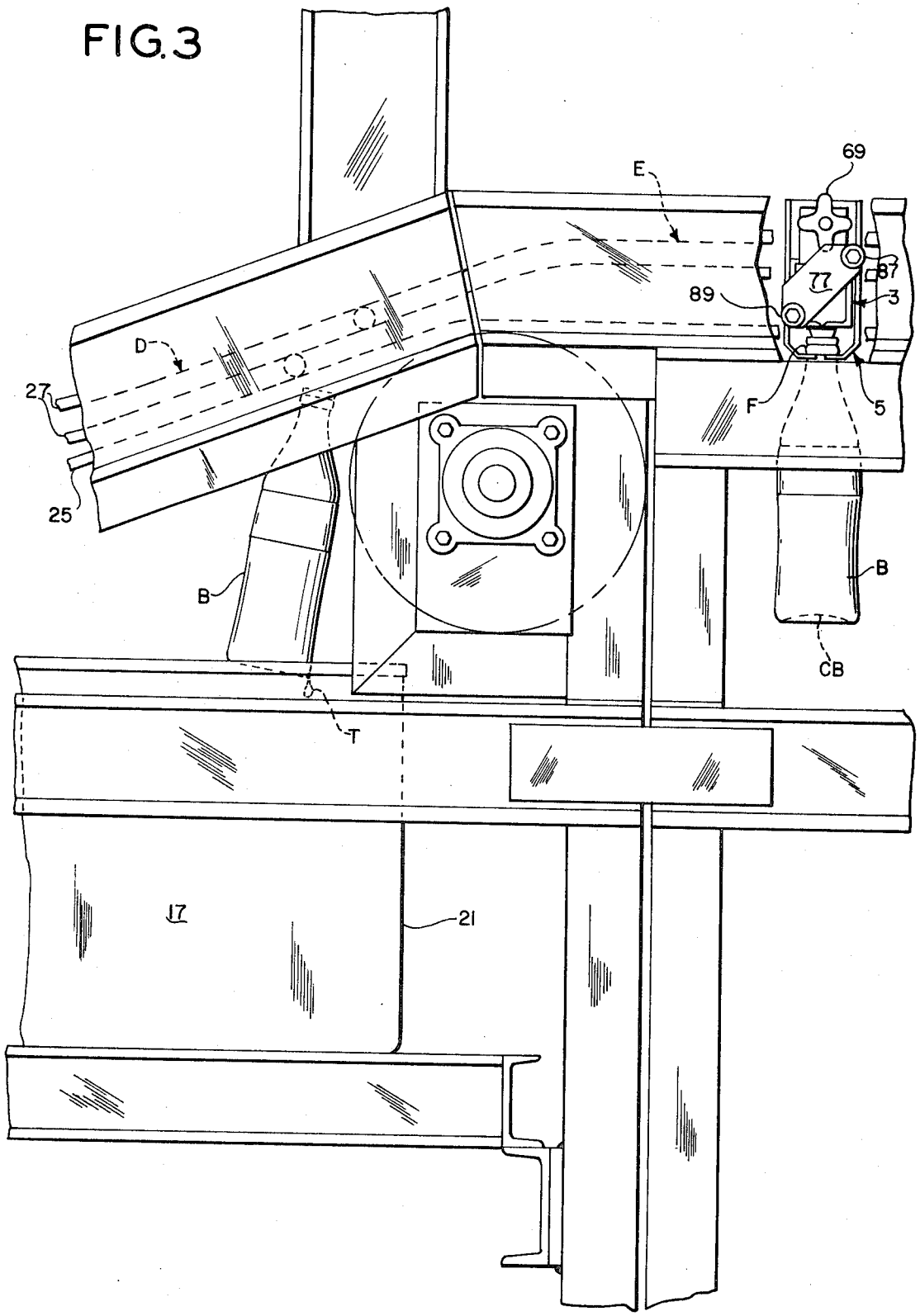
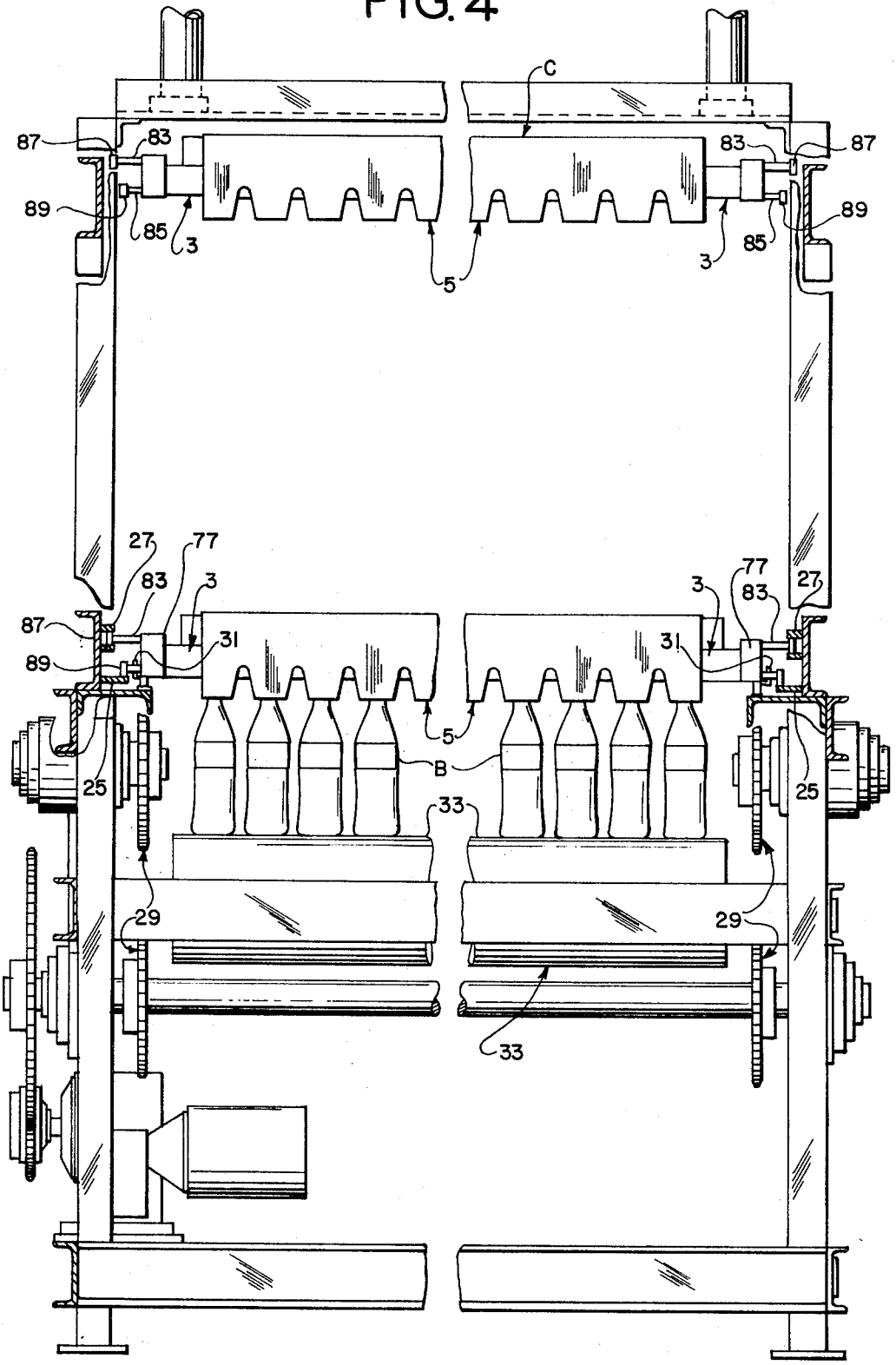


FIG. 4



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3,734,765

BOTTLE COATING

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Int. Cl. B44d 1/06; C03c 17/32
U.S. Cl. 117—94 10 Claims

ABSTRACT OF THE DISCLOSURE

A system of coating bottles in which rows of bottles issuing from a lehr, the bottles in each row standing upright side-by-side, are picked up by their necks, lowered into a bath of a liquid coating composition, e.g., a containment coating composition, for dip coating thereof on the outside, then moved forwardly through the bath and raised to withdraw them from the bath and, still gripped as specified, moved through a heating zone in upright position for heating the coating on the bottles. The bottles are then released and deposited on a conveyor for moving them forward with the bottles standing upright on the conveyor. As they are moved forward by the conveyor, they are sprayed with a molten plastic for lubricity and then cooled.

BACKGROUND OF THE INVENTION

This invention relates to the coating of glass bottles, and more particularly to a bottle coating system wherein the bottles are dip coated, as with a containment coating composition.

The invention is generally in the same field as U.S. Pat. No. 2,981,639, issued Apr. 25, 1961, entitled, "Process and Apparatus for Coating Glass Articles or the Like by Means of Dipping."

SUMMARY OF THE INVENTION

Among the several objects of this invention may be noted the provision of an improved bottle coating system such as described enabling efficient dip coating and drying and curing of rows of bottles in a continuous manner as they issue from a lehr; the provision of such a system adapted to maintain the quality of the coating for various lehr speeds and bottle sizes and finishes; the provision of such a system adapted to avoid entrapment of air in the usual concave bottoms of bottles as they dip into the bath of the coating composition; the provision of such a system adapted controllably to form a "tear" of the excess coating on each bottle as it is withdrawn from the bath, this tear being subsequently removed; and the provision of such a system wherein lubricity is imparted to the coated bottle.

In general, in accordance with this invention, rows of bottles standing upright are delivered (directly from a lehr, for example) to a pick-up station. There the entire row of bottles is picked up by gripping the necks of the bottles on the outside immediately below the finish at the bottle mouths and lowered into a bath of a coating composition, e.g., a containment coating composition, for dip coating of the bottles therewith. The row of bottles, so gripped, is moved forwardly through the bath and raised as it moves forward to withdraw the bottles from the bath. The coated bottles withdrawn from the bath are then moved through a heating zone for heating the coating thereon with the bottles generally upright.

Other objects and features will be in part apparent and in part pointed out hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a generally diagrammatic side elevation illustrating the system of this invention in part;

FIG. 1B is a continuation of FIG. 1 illustrating the remainder of the system;

FIGS. 2 and 3 are enlarged views of parts of FIG. 1A; and

FIG. 4 is a transverse section.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, there is indicated at **2** in FIG. 1A a portion of an endless belt conveyor which conveys glass bottles B through a lehr wherein the bottles are heated for annealing and "ion stuffing" as disclosed, for example, in the copending coassigned U.S. patent application of Clifford M. Brockway and Robert B. Reif, Ser. No. 200,119, filed Nov. 18, 1971, entitled, "Process for Strengthening Glass Objects." This belt conveyor has a horizontal upper reach **2***a* travelling continuously in the direction of the arrow shown in FIG. 1 generally at very low speed for the conveyance through the lehr of the bottles. The bottles stand upright on their bottoms on the upper reach of the belt conveyor, arranged in rows R extending transversely of the belt conveyor, with, for example, twenty bottles in each row spaced at equal intervals across the width of the conveyor, and with the rows R spaced at relatively close intervals longitudinally of the conveyor.

At the exit end of the forward-moving upper reach **2***a* of the belt conveyor **2** (its right end as viewed in FIG. 1) is a so-called dead plate **4** flush with the upper reach **2***a*. Each row R of bottles moved forward on the upper reach **2***a* of the belt conveyor to its exit end is moved further forward across the dead plate, over a lateral bypass endless belt conveyor **6**, and on to a so-called alignment plate **7** at a bottle pick-up station designated **S1** by a bottle accelerating pusher mechanism indicated generally at **9**. This includes a pusher **11** which functions to push each successive row R of bottles forward over the dead plate **4** and over the upper reach of the bypass conveyor **6** (with the latter out of operation and at rest) on to the alignment plate **7** at a higher speed than the speed of the lehr belt conveyor **2**.

The bottles B in the row R at the pick-up station **S1** on the alignment plate **7** are positioned for being grasped by a bottle carrier C to be carried thereby through a dipping operation and thence through a curing and drying operation. This bottle carrier C is the carrier which is fully disclosed and claimed in the copending coassigned U.S. patent application of Henry E. Hull, Herbert C. Abrams and Charles A. Cummings, Ser. No. 183,997, filed Sept. 27, 1971, entitled, "Bottle Carrier." In general, the bottle carrier C comprises an elongate support **3** (see FIG. 4) adapted to be conveyed by a conveyor means (as will appear) in a direction at right angles to its length, this support **3** carrying means generally designated **5** for clamping a plurality (e.g., twenty) of bottles B at their mouths with the bottles spaced at intervals along the length of the support and suspended at their mouths from the support. The clamping means **5** is formed to clamp the bottles on the outside thereof immediately below the finish F at the bottle mouths (see particularly FIG. 3). Support **3** has means including star wheels **69** at the ends thereof for effecting opening and closing of the clamping means, and arms **83** and **85** of unequal length extending outward from heads **77** at the ends of the support carrying inboard and outboard rollers **89** and **87**. Full details of the carrier C may be ascertained from the stated copending application Ser. No. 183,997.

At the bottle pick-up station **S1**, a bottle carrier C, with its bottle clamping means **5** open, is lowered as by a suit-

able conveyor means indicated at **13** to bring the clamping means into clamping position in respect to the necks of the bottles in the row R at station S1, at which point the star wheels **69** at the ends of the bottle carrier are rotated to close the clamping means for grasping all the bottles in the row (e.g., twenty bottles). The alignment plate **7** may then be swung down (see its dotted line position in FIG. 2) to clear it from the bottles, and the motion of the bottle carrier lowering conveyor means **13** is continued to carry the bottles gripped thereby forward and then downward into a bath **15** of a liquid coating composition, and more particularly a containment coating composition such as the acrylic-latex containment composition disclosed in the copending coassigned application of Larry G. McCoy and Robert E. Sharpe, Ser. No. 189,392, filed Oct. 14, 1971, entitled, "Containment Coating, Containers and Methods of Preparing Same." It will be understood that what is meant by a "containment" coating composition is a coating for bottles that is cured by heating into a clear glossy film which imparts increased mechanical strength to the bottles.

The bath **15** is contained in a tank **17**, the entrance end of which is indicated at **19** and the exit end of which is indicated at **21** in FIG. 1A. The pick-up station S1 (the alignment plate **7**) is located above and slightly rearward of the entrance end of the tank as illustrated in FIG. 1A. The liquid coating composition is maintained at a level such as indicated at L in FIG. 1A. After a row of bottles has been grasped by a carrier C at the pick-up station, the carrier C with the bottles suspended therefrom and rigidly held thereby is moved forward (toward the right as viewed in FIGS. 1A and 2) a short distance and then downward to submerge all the bottles carried thereby in the bath **15** in the tank. As the carrier is moved downward, it is rotated on an axis extending longitudinally thereof (this axis extending transversely of the tank) to tilt the bottles immediately prior to their entry into the bath to avoid entrapment of air in the usual concave bottoms CB (see FIGS. 2 and 3) of the bottles. Note the tilted position of the bottle indicated at B1 in FIGS. 1A and 2. The angle of tilt is preferably about 10° off vertical.

An elongate curing oven **23** extends forward (i.e., toward the right as viewed in FIGS. 1A and 1B) from the exit end **21** of the tank **17**. This oven extends up higher than the tank. Extending longitudinally of the tank **17** and oven **23** at each side thereof are two sets of tracks **25** and **27** and for the inboard and outboard rollers **89** and **87** at each end of a carrier C. These tracks have an inclined section D over the tank sloping upwardly from adjacent its entrance end to its exit end and a horizontal section E through the oven at the top thereof. After a carrier C along the tracks up the incline of section D of dip the bottles into the tank, the inboard and outboard rollers **89** and **87** at the ends of the carrier C come into engagement with the entrance ends of the tracks (adjacent the entrance end **19** of the tank) for travel of the carrier C along the tracks up the incline of section D of the tracks and then horizontally along section E of the tracks at the top of the oven **23**. Endless chain conveyor means such as indicated at **29** having pins **31** engageable with the short arms **85** at the ends of the carrier C is provided for pushing the carrier forward along the tracks.

As the row of bottles grasped by a carrier C is lowered and dipped into the bath **15**, once the bottoms of the bottles have entered the bath, the bottles are brought into a generally vertical position. Note the upright position of the bottle indicated at B2 in FIGS. 1A and 2. The bottles are fully dipped, i.e., dipped into the bath all the way up to their upper (mouth) ends as shown for the bottle indicated at B2. Once the bottles have been so dipped, they are moved forward and upward by reason of the pins **31** on the upper reaches of chain conveyor means **29** pushing the carrier C forward and upward along the inclined section D of tracks **25** and **27**. As the carrier moves forward and upward, it withdraws the bottles from the bath, and the tracks are so formed that as the carrier moves forward and upward, the carrier is rocked on an axis extending lengthwise thereof (transversely of the tank) to tilt the bottles back as shown for the bottles forward of the B2 bottle in FIG. 1A. Thus, the bottles are withdrawn from the bath at an angle to the vertical, preferably an angle of about 10°, the purpose of this being controllably to form a "tear" T of the excess composition draining down off the bottle, this tear being subsequently removed.

As the bottles come up and out of the bath they enter the oven **23** and are conveyed therethrough for drying and curing of the coating on the bottles. The oven is preferably a hot air oven, in which a temperature of about 350° F. to 500° F. is maintained for the drying and curing of the particular containment composition above specified. As the bottles travel forward through the oven, the carrier C carrying the bottles is rocked to bring the bottles to a vertical position and they travel in this position generally throughout the entire length of the oven (see FIGS. 1A and 1B).

At the exit end of the oven (its right end as shown in FIG. 1B), the bottles (in upright position) carried by the carrier C are brought over the trailing end of the horizontal upper reach **33***a* of an endless bottle take-off belt conveyor **33**, which is continuously driven at generally the same speed as the conveyor means **29**. At this point, the clamping means **5** of the carrier C is opened, and the bottles thereby released from the carrier C are deposited in upright position on the upper reach **33***a* of the conveyor **33** and are thereby conveyed further forward out of and away from the exit end of the oven. As they travel forward with the upper reach **33***a* of belt conveyor **33**, they are sprayed at **35** with molten polyethylene for lubricity, and then pass through a forced cooling zone **37** for cooling the polyethylene coating, and the bottles exiting from the cooling zone are taken away by a lateral take-away conveyor **39**.

Back at the exit end of the oven **23**, the carrier C which has been emptied of its load of bottles, is picked up by a carrier elevator **41** and raised to a carrier quick return conveyor **43** which functions quickly to return the carrier at higher speed than the speed of its forward movement through the bath and through the heating zone constituted by the oven back to a position adjacent the pick-up station for being taken over by the carrier lowering conveyor **13**.

If it should be desired to bypass the coating equipment, the pusher mechanism **9** is deactivated, and each row of bottles is pushed forward onto the upper reach of the bypass conveyor **6** by subsequent rows of bottles issuing from the lehr. Conveyor **6** then delivers the bottles directly to an inspection area.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above methods without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. The method of coating bottles comprising delivering a row of bottles standing upright to a pickup station, picking up the row of upright bottles by gripping the necks thereof on the outside immediately below the finish at the bottle mouths and lowering the bottles into a bath of a coating composition for dip coating of the bottles therewith, moving the row of bottles forwardly through the bath and raising them as they move forward to withdraw them from the bath, and moving the coated bottles withdrawn from the bath through a heating zone

for heating the coating thereon with the bottles generally upright.

2. The method of claim 1 wherein the bottles have concave bottoms and are moved downwardly into the bath at such an angle to the vertical as to avoid entrapment of air in the concave bottoms.

3. The method of claim 1 wherein the bottles are withdrawn from the bath at an angle to the vertical controllably to form a tear of the coating at the bottom of each bottle.

4. The method of claim 1 wherein, after the heating, the bottles are released and deposited on a conveyor for moving them forward with the bottles standing upright on their bottoms.

5. The method of claim 4 wherein the bottles are sprayed with a molten plastic for lubricity and then cooled as they are moved forward by said conveyor.

6. The method of claim 4 wherein the bottles are picked up at the pick-up station by a carrier which is moved downward to submerge the bottles in the bath and then moved forward and upward to withdraw the bottles from the bath and continues in motion forward to move the bottles through the heating zone, the bottles being released from the carrier at the exit end of the heating zone and the carrier being returned to the pick-up station to pick up another row of bottles.

7. The method of claim 6 wherein the carrier is returned at higher speed than its speed of movement through the bath and the heating zone.

8. The method of claim 7 wherein the carrier is moved forward by one conveyor and returned by another.

9. The method of claim 1 wherein the rows of bottles are delivered from a lehr to the pick-up station.

10. The method of claim 9 wherein the rows of bottles exit continuously from the lehr at one speed and are delivered therefrom to the pick-up station at a higher speed.

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RALPH HUSACK, Primary Examiner

U.S. Cl. X.R.

65—60; 117—105.3, 113, 124 E; 118—423, 503; 215—1 R, DIG. 6