

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) BOTTLING SYSTEM

(71) We, SHIKOKU KAKOOKI KABUSHIKI KAISHA, of No. 10-1, Aza-Nishinokawa, Tarohachizu, Kitajimacho, Itano, Tokushima, Japan; a corporation organized and existing under the laws of Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to apparatus for making bottles of synthetic resin (plastics material) by moulding and for filling the bottles and also relates to a bottle reservoir for use therein.

In the production of bottled beverages, it has been a general practice to collect empty bottles after use, to clean the bottles and subsequently fill the bottles with milk or other beverage. Such method is, however, troublesome in that considerable labour is required for collection and cleansing of the bottles.

The present invention is concerned with the use of disposable plastics material bottles which can be manufactured in large quantities at a very low cost, and as an alternative to using recollected bottles. All the operations, starting with moulding of the bottles and terminating with a filling operation are carried out continuously under sanitary conditions, so that commercial products are prepared one after another and favourably have printing provided thereon.

According to the present invention there is provided apparatus for producing and handling bottles or the like vessels made of synthetic resin material, comprising in combination, a bottle moulding machine for producing synthetic resin bottles, and bottle conveying means for transferring bottles from the moulding machine to a bottle aligning machine which is capable of continuously receiving bottles and of suc-

cessively discharging them in upright position. Preferably a bottle reservoir is interposed in said conveying means between said moulding machine and said aligning machine.

Also according to the present invention, there is provided a bottle reservoir comprising a storage tank having a circular opening in a lower region and bottle discharge means located in said region; said discharge means being rotatable about a substantially vertical axis and comprising rotatably mounted bottle support means having at least one opening therein for the passage of bottles and being rotatably mounted within a portion of the reservoir forming the circular opening, and rotary displacing means mounted beneath said support means; said displacing means being rotatable so as to convey bottles falling through the opening in said support means to an outlet aperture.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a diagrammatic side elevation of the entire bottle manufacturing and filling apparatus;

Fig. 2 is an enlarged sectional view of a discharge device for a storage tank taken along the line M-M of Fig. 1;

Fig. 3 is a sectional view taken along the line N-N in Fig. 2; and

Fig. 4 is a plan view of a bottle printing press.

Fig. 1 shows a hollow injection moulding machine A, a storage tank B, an air chute C by which bottles produced by the moulding machine are sent into the storage tank B, a blower D therefor, a bottle aligning machine E, a completely sealed bucket conveyor F for transferring the bottles from the storage tank B to the bottle aligning machine E, a printing press G, a control panel H for controlling the amount of

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(17) the bottles to be fed to a bottling machine I, a cap forming machine J, a heat sealer K for capping, a bottle collecting table T, and a conveyor L extending from the bottle aligning machine E to the bottle collecting table T.

In the apparatus, bottles formed by the moulding machine A are sent into the storage tank B, from which they are continuously charged into the bottle aligning machine E at a constant rate. The bottles are then conveyed from the aligning machine E in a row with their mouths facing upwards and carried to the printing press G where they are printed on the side surface. This operation is followed by a filling operation at the bottling machine I, and capping by the heat sealer K. Finally the bottles are collected on the table T.

The storage tank B ensures the supply of a constant quantity of bottles to the aligning machine E even when the moulding machine A is out of operation for inspection and maintenance. It should be understood as being within the scope of the invention that in the case where the moulding machine A and the aligning machine E are operated in synchronism, the tank B may be dispensed with. The printing press G may be disposed at a desired position along the conveyor path L for a row of the upstanding bottles which extends from the aligning machine E to the bottle collecting table T.

The storage tank B and particularly a discharge device thereof, is shown in Figs. 2 to 3. A short cylindrical portion 1 extends downward from the bottom wall of the storage tank B. The bottom plate 2 of the cylindrical portion 1 is secured by bolts and nuts to a flange 3 attached to the lower end of the cylindrical portion 1. A discharge outlet 4 nearly rectangular in section is formed in the bottom plate 2 on one side and has a chute 5 tightly fitted therein and extending outward obliquely. An upright drive shaft 7 is coaxial with the cylindrical portion 1 and extends through the bottom plate 2. A bearing box 8 welded to the bottom plate 2 houses upper and lower bearings 13 and 14. Attached to the bottom plate 2 of the cylindrical portion 1 is a frame, U-shaped in cross section, in which a motor 10 and a reduction gear 11 are disposed. An electromagnetic clutch 12 is included in a transmission system for transmitting the rotation of the motor 10 to the drive shaft 7 by way of the reduction gear 11 and is controlled by the photoelectric tube means on the aligning machine E for detecting the amount of bottles.

Rotatably mounted on the upper end of the drive shaft 7 by means of a bearing 6 is an umbrella-like member 15 including a

slanting portion 15a and a vertical portion 15b. The umbrella-like member 15 has a bearing box 16 welded to its upper end centrally thereof and a rotary disc 17 welded to an upper part of the vertical portion 15b. The rotary disc 17 has a diameter slightly smaller than the inner diameter of the cylindrical portion 1 and is formed at its centre with an opening in conformity with the outer periphery of the umbrella-like member 15. The vertical portion 15b of the umbrella-like member 15 fits into the opening for welding to the disc. A stirrer projection 18 of an inverted V-shaped cross section is secured to the disc 17 and extends in a radial direction. Part of the disc 17 is cut out to provide an opening 19 for dropping the bottles, which may alternatively be in the form of a hole. A sector-like plate 20 for controlling the area of the opening 19 is slidable on arcuate guides 21 and 22. The control plate 20 is formed along its inner edge with several holes 23, and a bolt 24 is passed through one of the holes 23 to fasten the plate 20 to the guide 22 and the disc 17 with a nut at the controlled position. Welded to the lower part of the inner face of vertical portion 15b is an internal gear 25 meshing with two pinions 26, which in turn mesh with a centre gear 27 secured to the upper end of the bearing box 8. The shafts 28 of the pinions are supported at their upper ends by a horizontal bracket 29 fixed to the drive shaft 7.

An annular member 30 disposed under the umbrella-like member 15 is somewhat smaller in diameter than the umbrella-like member 15 and extends upward slightly beyond the lower end of the vertical portion 15b of the umbrella-like member 15. A support 31 in the form of a doughnut is welded to the lower end of inner face of the annular member 30 and receives the lower ends of the pinion shafts 28. Four upright blades 32 made of a resilient material extend radially from the annular member 30 and have such length that they almost come into contact with the inner face of the cylindrical portion 1. The resilient material may preferably be Neoprene (polychloroprene). The number of the blades 32 may vary as desired but the effectiveness thereof increases when at least several blades are provided.

In the foregoing construction, the disc 17 and the blades 32 are driven in a counter-clockwise direction in Fig. 2, and the former is faster than the latter. More specifically, the rotation of the drive shaft 7 is transmitted to the blades 32 by way of the bracket 29 and the pinion shafts 28, while it is delivered to the disc 17 through the bracket 29, pinions 26 and internal

gear 25. The disc 17 and blades 32 need not be driven in the same direction but may be driven in reverse directions. Further the disc 17 need not be driven at a higher speed than the blades 32 but may be rotated at a lower speed. However, either one may preferably be faster than the other to eliminate variation in the amount of discharge.

Bottles supplied from the air chute C into the tank B are led along its slanting bottom to the cylindrical portion 1, collected on the disc 17 and then drop through the opening 19 onto the bottom plate 2 smoothly one after the other due to the rotation of the disc 17. The bottles are thereafter pushed toward the discharge outlet 4 by the blades 32 and finally sent out from the discharge chute 5 at a substantially constant rate.

Without the disc 17, the bottles would get entangled with one another in complicated manner and bridge the outlet 4 thus preventing themselves from dropping smoothly. In the event the rotating blade should hit the bottles blocking the outlet 4, some bottles would then be pressed against the edge of the outlet 4 and broken. In accordance with the apparatus described above, however, the bottles are first received by the rotary disc 17 at the upper portion and then uniformly and successively drop through the opening 19 onto the bottom plate 2 of the cylindrical portion 1 as the disc 17 goes on rotating. The bottles are thereafter brought to the discharge outlet 4 by the rotary blades 32, from which they are sent out substantially at a constant rate without breakage.

The bottle aligning machine E has outer fixed and inner rotating coaxial cylinders of the kind described in U.S. Patent No. 3,543,909 wherein bottle positions are defined on the outside towards the upper part of the inner cylinder with a floor and limits. These bottle positions rotate within the outer cylinder. There is a floor on said inner cylinder, and delivery means to drop bottles on this floor; guide means in said inner cylinder to guide the bottles to a location over said positions; engaging and clearing means at said location to engage the bottom of bottles and clear the neck of bottles so as to drop the bottles into the position bottomside down.

The printing press G for providing suitable printing on the side faces of the aligned upright bottles may be a known offset printing machine. The structure of the machine will be described below briefly. With reference to Fig. 4, an offset rubber drum 33 has a peripheral surface, part of which is positioned in the path of travel of a row of the bottles on the conveyor L. An arcuate pressing plate 34 is spaced

apart from the rubber drum 33 in facing relation by a distance for interposing a bottle therebetween. A nozzle 36 for applying ink to a plate drum 35 is connected to a pump 37. An ink pot is indicated at 38; cleaning rollers for wiping off excess ink on the rubber drum, at 39; a timing screw for controlling the distance between the bottles to be continuously fed to the printing press G, at 40; and a belt for sending out the bottles after printing, at 41.

The ink applied to the plate drum 35 by the nozzle 36 is further applied to the offset rubber drum 33. On the other hand, the upright bottles sent forward in a row from the aligning machine E by the conveyor L are carried forward while being rotated by contact with the rubber drum 33, whereby they are printed on the sides thereof by the rubber drum 33. After printing, the bottles are fed to the bottling machine I for the subsequent filling operation as already described.

Bottles of synthetic resin are manufactured by the moulding machine and successively sent to the aligning machine, from which they are taken out in the upright position and then fed into the bottling machine one after another. Accordingly, the overall operation starting with the moulding of the bottles can be carried out smoothly and continuously. Moreover, since a row of upstanding bottles are sent out from the aligning machine and led to the printing machine by a conveyor line for printing on the side thereof, the apparatus has the advantage that commercial products are obtained with printing provided thereon.

WHAT WE CLAIM IS:—

1. Apparatus for producing and handling bottles or the like vessels made of synthetic resin material, comprising in combination, a bottle moulding machine for producing synthetic resin bottles, and bottle conveying means for transferring bottles from the moulding machine to a bottle aligning machine which is capable of continuously receiving bottles and of successively discharging them in upright position.

2. Apparatus as claimed in claim 1, including a bottle reservoir interposed in said conveying means between said moulding machine and said aligning machine.

3. Apparatus as claimed in claim 2, in which the conveying means includes a duct and pressurizing means for producing positive or negative fluid pressure within said duct to cause bottles to be conveyed from said moulding machine into said reservoir and/or a mechanical device for conveying bottles from the reservoir to said aligning machine.

4. Apparatus as claimed in claim 3, in



gear 25. The disc 17 and blades 32 need not be driven in the same direction but may be driven in reverse directions. Further the disc 17 need not be driven at a higher speed than the blades 32 but may be rotated at a lower speed. However, either one may preferably be faster than the other to eliminate variation in the amount of discharge.

Bottles supplied from the air chute C into the tank B are led along its slanting bottom to the cylindrical portion 1, collected on the disc 17 and then drop through the opening 19 onto the bottom plate 2 smoothly one after the other due to the rotation of the disc 17. The bottles are thereafter pushed toward the discharge outlet 4 by the blades 32 and finally sent out from the discharge chute 5 at a substantially constant rate.

Without the disc 17, the bottles would get entangled with one another in complicated manner and bridge the outlet 4 thus preventing themselves from dropping smoothly. In the event the rotating blade should hit the bottles blocking the outlet 4, some bottles would then be pressed against the edge of the outlet 4 and broken. In accordance with the apparatus described above, however, the bottles are first received by the rotary disc 17 at the upper portion and then uniformly and successively drop through the opening 19 onto the bottom plate 2 of the cylindrical portion 1 as the disc 17 goes on rotating. The bottles are thereafter brought to the discharge outlet 4 by the rotary blades 32, from which they are sent out substantially at a constant rate without breakage.

The bottle aligning machine E has outer fixed and inner rotating coaxial cylinders of the kind described in U.S. Patent No. 3,543,909 wherein bottle positions are defined on the outside towards the upper part of the inner cylinder with a floor and limits. These bottle positions rotate within the outer cylinder. There is a floor on said inner cylinder, and delivery means to drop bottles on this floor; guide means in said inner cylinder to guide the bottles to a location over said positions; engaging and clearing means at said location to engage the bottom of bottles and clear the neck of bottles so as to drop the bottles into the position bottomside down.

The printing press G for providing suitable printing on the side faces of the aligned upright bottles may be a known offset printing machine. The structure of the machine will be described below briefly. With reference to Fig. 4, an offset rubber drum 33 has a peripheral surface, part of which is positioned in the path of travel of a row of the bottles on the conveyor L. An arcuate pressing plate 34 is spaced

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Bottles of synthetic resin are manufactured by the moulding machine and successively sent to the aligning machine, from which they are taken out in the upright position and then fed into the bottling machine one after another. Accordingly, the overall operation starting with the moulding of the bottles can be carried out smoothly and continuously. Moreover, since a row of upstanding bottles are sent out from the aligning machine and led to the printing machine by a conveyor line for printing on the side thereof, the apparatus has the advantage that commercial products are obtained with printing provided thereon.

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2. Apparatus as claimed in claim 1, including a bottle reservoir interposed in said conveying means between said moulding machine and said aligning machine.

3. Apparatus as claimed in claim 2, in which the conveying means includes a duct and pressurizing means for producing positive or negative fluid pressure within said duct to cause bottles to be conveyed from said moulding machine into said reservoir and/or a mechanical device for conveying bottles from the reservoir to said aligning machine.

4. Apparatus as claimed in claim 3, in



which the mechanical conveying device is a bucket conveyor.

- 5 5. Apparatus as claimed in any of claims 1 to 4, further including a bottle filling machine which is supplied with bottles from the aligning machine, and/or a printing machine, disposed in the path of travel of the upright bottles, and/or a bottle closing machine for closing said bottles.
- 10 6. A bottle reservoir for use in the apparatus of claims 2 to 5, comprising a storage tank having a circular opening in a lower region and bottle discharge means located in said region; said discharge means being rotatable about a substantially vertical axis and comprising a rotatably mounted bottle support means having at least one opening therein for the passage of bottles and being rotatably mounted within a portion of the reservoir forming the circular opening, and rotary displacing means mounted beneath said support means; said displacing means being rotatable so as to convey bottles falling through the opening in said support means to an outlet aperture.
- 15 7. A bottle reservoir as claimed in claim 6, in which the bottle support means is a disc mounted within a cylindrical neck portion of the reservoir, and in which the rotary displacing means is at least one blade mounted above a bottom wall in the neck; said outlet aperture being formed in said bottom wall.
- 20 8. A bottle reservoir as claimed in claim

7, in which the opening in said disc is adjustable in dimension to enable the flow of bottles to be controlled.

9. A bottle reservoir as claimed in claim 7, in which said blade is rotatable in the same or opposite direction with respect to the direction of rotation of said disc.

10. A bottle reservoir as claimed in claim 9, in which at least one blade and said disc are rotatable at different relative speeds by means of differential gearing.

11. A bottle reservoir as claimed in any of claims 7 to 10, in which at least one projection is mounted on the upper surface of said disc to stir bottles when located in the main body of the reservoir above the disc.

12. A bottle reservoir as claimed in any of claims 7 to 11, in which a conveyor is provided to transfer bottles from the outlet of said reservoir to the aligning device.

13. A bottle reservoir as claimed in claim 12, in which the conveyor is a bucket conveyor.

14. Apparatus for producing and handling bottles of plastics material substantially as herein described and illustrated with reference to Fig. 1 of the accompanying drawings.

15. A bottle reservoir substantially as herein described and illustrated with reference to Figs. 2 and 3 of the accompanying drawings.

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