April 14, 1959 L. R. CUNHA 2,881,918

BOTTLE SORTING MECHANISM

Filed Nov. 20, 1956

2 Sheets-Sheet 1

FIG_1

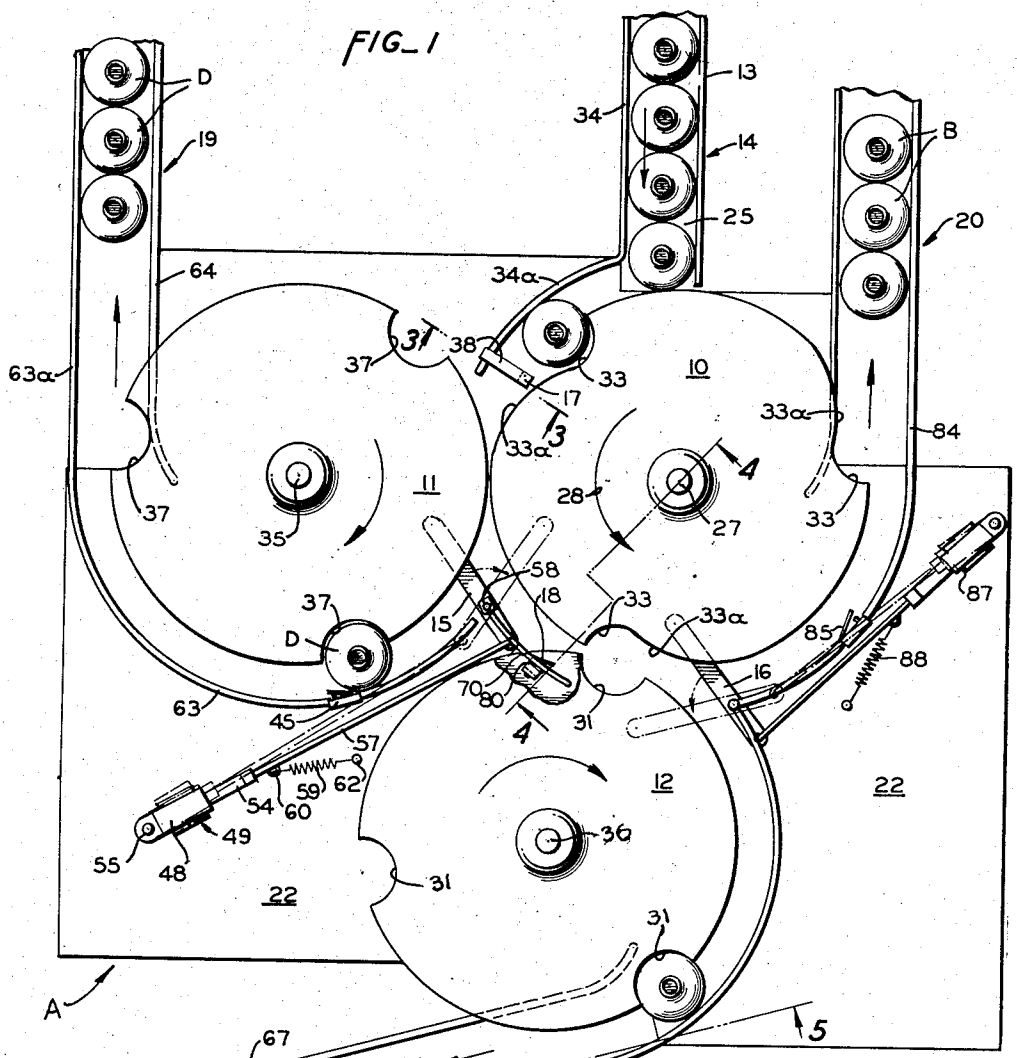
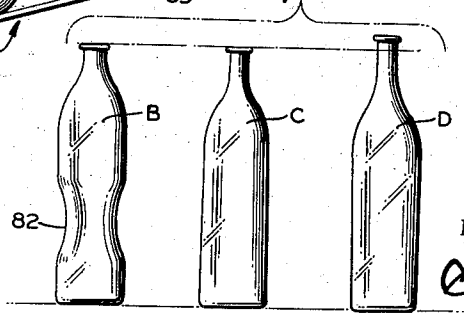


FIG_2



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2 Sheets-Sheet 2

FIG_3

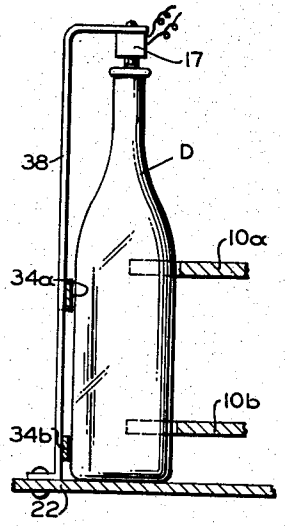


FIG_4

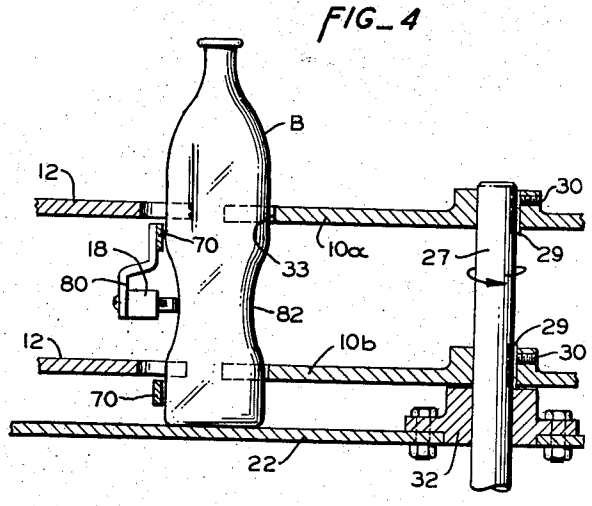


FIG_5

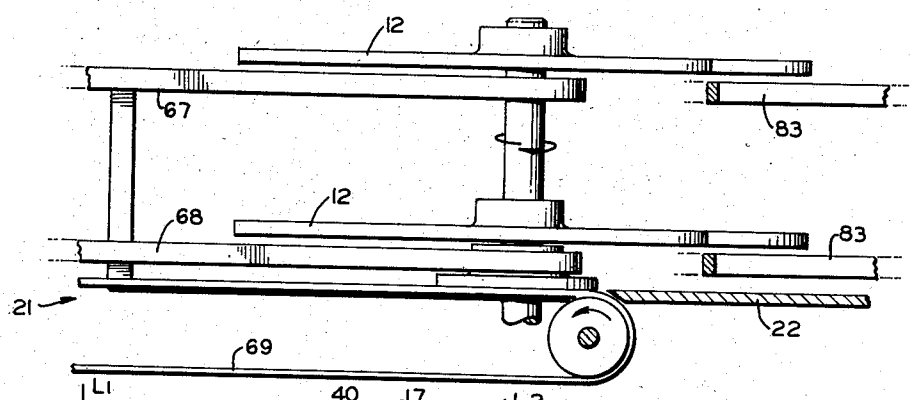
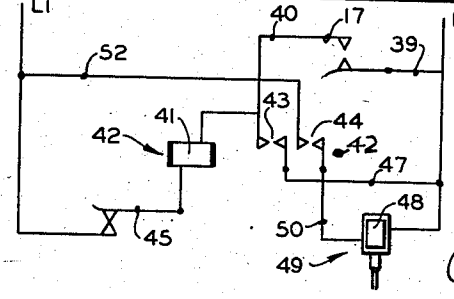


FIG_6



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BOTTLE SORTING MECHANISM

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Application November 20, 1956, Serial No. 623,351

5 Claims. (Cl. 209—90)

The present invention relates to bottle sorting, and pertains more particularly to a machine for sorting out individual types of bottles from an indiscriminately intermixed plurality thereof fed into the machine.

Many bottling plants and distributors of bottled beverages handle a plurality of different beverages which frequently are bottled in different types of bottles. When these bottles are returned by their dealers or customers, the bottles frequently are intermixed one with the other. Sorting out these bottles by hand is a tedious and relatively costly operation.

The present invention contemplates the provision of a machine for automatically sorting out bottles having different physical characteristics from an indiscriminately intermixed plurality thereof, and for transporting each distinctive type of bottle to a separate take-off line.

The invention also provides a plurality of notched rotors arranged to accept bottles one at a time from a feed line and for moving the bottles past successive testing switches, each of which is adapted to detect the presence or absence of a specific physical characteristic of each bottle passing it, and, when actuated, to operate a bottle-deflecting gate so as to route each type of bottle to a separate take-off line.

Another object of the invention is to provide an improved machine for sorting out from each other bottles having different physical characteristics.

These, and other objects and advantages of the invention, will be apparent from the following description and the accompanying drawings, wherein

Fig. 1 is a plan view of a bottle sorting mechanism embodying the present invention, portions being broken away.

Fig. 2 is a side elevational view of three bottles, each having individual physical characteristics which permit the bottles to be sorted out, one from the other, by the mechanism illustrated in Fig. 1.

Fig. 3 is an enlarged, fragmentary, sectional view taken along line 3—3 of Fig. 1.

Fig. 4 is an enlarged, fragmentary, sectional view taken as along line 4—4 of Fig. 1, but showing the first pair of rotors rotatively advanced to position a bottle in a pair of notches therein at the second deflector gate actuating switch.

Fig. 5 is an enlarged, fragmentary, sectional view taken along line 5—5 of Fig. 1.

Fig. 6 is a schematic circuit diagram for a solenoid switching circuit for the bottle deflecting gates.

Briefly, a bottle sorting machine A (Fig. 1) embodying the invention is arranged to sort out from each other three different types of bottles B, C and D (Fig. 2). The illustrated machine A comprises three pairs of notched rotors consisting of a pair of primary rotors **10**, and secondary rotors **11** and **12**. The rotors of each pair thereof are mounted co-axially and in axially spaced relation as shown in Figs. 3, 4 and 5, the secondary rotors **11** and **12** being mounted marginally adjacent the primary rotors, and spaced laterally from each other.

The secondary rotors **11** and **12** are driven to turn in the oppoiste direction from the primary rotors **10** by conventional drive means, not shown.

A plurality of indiscriminately intermixed bottles **13** of three different types are fed into the machine A along a feed line **14**. Physical differences between the different types of bottles passing through the machine are detected by a pair of gate switches **17** and **18**, which selectively actuate a pair of bottle deflecting gates **15** and **16** to sort out the different types of bottles from each other, and to direct them selectively toward three different take off lines **19**, **20** and **21**.

Referring to the details of the mechanism shown in Fig. 1, a flat, plate-like member **22**, of suitable material such as sheet steel, provides a supporting surface along which the bottles fed into the machine may slide on their bases.

The feed line may comprise a conventional belt conveyor **25** moving in the direction of the arrow thereon in Fig. 1 to advance the row of indiscriminately intermixed bottles **13** thereon toward the primary rotors **10** (Figs. 1 and 4). The rotors **10** are designated, respectively, **10***a* (upper) and **10***b* (lower) and are mounted co-axially on a common shaft **27** which is driven by conventional drive means, not shown, in the direction of the arrow **28** in Fig. 1.

The rotors **10***a* and **10***b* are secured by keys **29** and set screws **30** to their common shaft **27**, which is journaled in an axially upright bearing **32** mounted in a hole provided therefor in the support plate **22**. The primary rotors **10***a* and **10***b* are provided with a plurality of similar, vertically aligned, bottle receiving notches **33** in their peripheries.

The forward side **33***a* of each notch **33** is faired out in a gradual curve as shown in Fig. 1 to permit each successive foremost bottle **13** in the feed line **14** to advance gradually into each successive notch **33** presented thereto as the rotors **10** turn constantly in the direction of the arrow **28** in Fig. 1.

The secondary rotors **11** and **12** are also mounted on upright shafts **35** and **36** similarly to the rotors **10** of Figs. 1 and 4, and are provided with peripheral notches **37** and **31**, respectively. The primary rotors **10**, and the secondary rotors **11** and **12**, are rotatively driven by conventional drive means in the directions of the curved arrows thereon at speeds to bring the bottle receiving notches of the secondary rotors **11** and **12** into register with successive notches **33** in the primary rotors **10** at the zones of peripheral adjacency of the primary and secondary rotors.

Continuations **34***a* and **34***b* (Figs. 1 and 3) of a pair of similar, vertically spaced guide rails **34** of the feed line **23** are curved concentrically with, and in radially spaced relation to, the primary rotors **10** to guide bottles **13** fed into the notches **33** as the latter are carried around by the rotation of the rotors **10**.

As each bottle **13** is carried around between notches **33** in the primary rotors **10** and the rails **34***a* and **34***b*, it passes beneath the first gate actuating switch **17**, which is mounted on an arm **38** (Figs. 1 and 3) to centrally overlie the common path of the necks of the bottles **13** at this point. The switch **17** is mounted at a height to clear the shorter bottles B and C (Fig. 2) but to be engaged and actuated by the taller bottles D.

As each bottle arrives at the end of the circularly curved rails **34***a* and **34***b*, it will be received between the notches **33** in the rotors **10** and a pair of correspondingly moving notches **37** in the secondary rotors **11**, and thus will be advanced to the first deflector gate **15**.

A suitable electrical circuit for actuating the deflecting gates **15** and **16** is shown in Fig. 6. Since the circuits

employed for both gates 15 and 16 are identical, that for the first gate 15 only will be described.

Referring to Fig. 6, closing of the normally open, bottle actuated switch 17 closes a relay-actuating circuit from line 2, designated L2, through conductor 39, switch 17, conductor 40, the coil 41 of a holding relay 42 having two pairs of contact points 43 and 44 thereon, and the normally closed restoring switch 45 to line 1, designated L1.

Actuation of the relay 42 closes a holding circuit from L2 through conductor 47, relay contact points 43, relay coil 41 and restoring switch 45 to L1. The closing of relay 42 also closes a solenoid actuating circuit from L2 through the coil 48 of solenoid 49, conductor 50, relay points 44 and conductor 52 to L1. Opening of the restoring switch 45 by a bottle D as the latter is carried past the restoring switch opens the holding circuit through the relay coil 41 and thus restores the circuit to its normal open condition shown in Fig. 6.

The solenoid coil 48 (Fig. 1) is pivotally mounted on the support plate 22 by a pivot pin 55, and its core 54 is connected by a link 57 to one end of the first deflector gate 15. The gate 15 may be a straight bar pivotally mounted on a pivot post 58 secured to the support plate 22. The gate 15 preferably is positioned at a height above the support 22 to lie between the upper and lower notched rotor discs of each pair thereof.

The deflector gate 15 normally is held by a coil spring 59 in its solid line position of Fig. 1. The spring 59 is connected in tension from an eye 60 on the link 57 to an anchor post 62 on the support plate 22.

With the gate 15 held in its actuated, broken line position of Fig. 1 by the holding circuit of Fig. 6, as each taller bottle D arrives at the gate 15 such bottle is deflected toward the left, as shown in Fig. 1, and is guided by guide rails 63, generally similar to the rails 34*a* and 34*b* of Fig. 3, around to the first take-off line 19.

The take-off line 19, which is generally similar to the other take-off lines 20 and 21, comprises a pair of vertically spaced outer guide rails 63*a*, which may be continuations of the curved guide rails 63 around the rotors 11, and a second pair of straight rails 64, also generally similar to the rails 34*a* and 34*b*, and which extend inwardly beneath the upper and lower rotors 11, respectively, as indicated in broken lines in Fig. 1.

A belt conveyor 69, similar to the conveyor 25 of the feed line, may be mounted between the rails 63*a* and 64 to carry the bottles D to a desired destination.

As each taller bottle D is carried past the normally closed restoring switch 45, such bottle actuates this switch, which, as shown in Fig. 6, opens the holding circuit through the relay 42 and thus restores the circuit to its normal, open condition. The spring 59 thereupon swings the gate 15 back to its normal, solid line position of Fig. 1. It will be noted from the relative locations of the switches 17 and 45 in Fig. 1 that the first gate 15 will be restored to its normal condition before a succeeding bottle 13 from the feed line 23 arrives at the overhead switch 17.

Since the shorter bottles B and C do not actuate the overhead switch 17 in passing it, when these shorter bottles arrive at the first gate 15 the latter will be in its normal solid line position of Fig. 1. These bottles B and C, therefore, will be deflected toward the right by the gate 15 as shown in Fig. 1, and will be retained in the notches 33 by short, curved guide rails 70 (Figs. 1 and 4) mounted beneath the upper and lower rotors 12 respectively, similarly to the rails 67 and 68 in Fig. 5.

The second gate actuating switch 18 is mounted on a bracket 80 (Fig. 4) spanning the short, curved guide rails 70. The switch 80 is of the normally open type and has an actuating arm 81 thereon which projects into the path of the bottles passing it at a height to clear the indented side portions 82 of the bottles B. The second bottle deflecting gate 16 is actuated by the switch 18 by means of a circuit (not shown) similar to that shown in Fig. 6, and is similar to the first gate 15 described previously herein.

The second gate 16 therefore, remains in its normal, solid line position of Fig. 1 at the approach of each indented side bottle B, and such bottles are deflected downwardly by the gate and are carried around to the third take-off line 21 (Figs. 1 and 5) between a notch 31 in the secondary rotors 12 and a guide rail 83.

The second deflecting gate 16 is in its actuated, broken line position of Fig. 1 at the approach of each straight sided bottle C, and such bottles are deflected upwardly by the gate 16 and are carried around to the second take-off line 20 between a notch 33 in the primary rotors 10 and a guide rail 84.

As each straight sided bottle C passes and actuates the second restoring switch 85, it releases the holding circuit for the second gate actuating solenoid 87 and allows a spring 88 to restore the solenoid 87 and gate 16 to their normal, solid line positions of Fig. 1.

Since the means for driving the rotors at proper speeds in the direction of their respective arrows, and the means for actuating the conveyors for the feed and take-off lines are of types well known to those familiar with the art, and since they are not claimed per se herein, they are not described in detail.

The invention provides a simple, inexpensive, reliable mechanism which rapidly sorts out bottles having different physical characteristics from each other, and without the need of attention except to supply the bottles to the feed line and to remove them from the take-off line.

While I have shown the switches positioned for the three physically different bottles illustrated in Fig. 2, it is obvious that the switches 17 and 18 may be arranged differently and as required for selective actuation by other bottles having different physical characteristics, it being only necessary that each bottle to be separated from the others passing each gate actuating switch shall have a physical characteristic which will permit it to be engaged by one of the switches, and that each of the succeeding bottles passing through the mechanism shall pass such switch without actuating it. Thus, each distinctive type of bottle can be eliminated one at a time from the indiscriminately mixed line of bottles fed into the machine at the feed line 14.

While I have illustrated and described a preferred embodiment of the present invention, it will be understood however that various changes and modifications may be made in the details thereof without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims.

I claim:

1. A bottle sorting mechanism comprising a marginally notched primary rotor, a plurality of marginally notched secondary rotors arranged in marginally adjacent relation to the primary rotor, the primary and secondary rotors being rotatively driven at corresponding peripheral speeds and in opposite directions, with notches in each secondary rotor registering with successive notches in the primary rotor, a feed line for feeding bottles into successive notches in the primary rotor for advancement thereby along a predetermined path between adjacent rotors, a plurality of detector means mounted along such path, each detector means being mounted to detect the presence or absence of a specific physical characteristic of each bottle passing it along such path, deflectors mounted in such path and operatively connected one to each detector means, and means urging each deflector toward a predetermined bottle deflecting position normally to maintain a bottle passing

the deflector on such predetermined path, each deflector being moved to bottle deflecting position upon a detecting actuation of its associated detecting means, thereby to deflect a bottle which actuates the detector means away from such predetermined path.

2. A bottle sorting mechanism comprising marginally notched primary and secondary rotors arranged in marginally adjacent relation, the primary and secondary rotors being rotatively driven at corresponding peripheral speeds and in opposite directions, with notches in each secondary rotor registering with successive notches in a primary rotor, means for feeding bottles into successive notches in a primary rotor for advancement thereby between adjacent rotors, detector means mounted in the path of bottles advanced in notches of the primary rotor and positioned to detect the presence or absence of a specific physical characteristic of each bottle passing said detector means along such path, a deflector mounted in the path of bottles being advanced in the notches of the primary rotor and operatively connected to each detector means, and means urging each deflector toward one position to maintain a bottle passing the deflector in its notch in a primary rotor, each deflector being actuated by a detecting actuation of its associated detecting means to deflect a bottle which actuates the detecting means clear of its notch in a primary rotor.

3. A bottle sorting mechanism comprising a marginally notched primary rotor, a plurality of marginally notched secondary rotors arranged in marginally adjacent relation to the primary rotor and in spaced relation to each other, the primary and secondary rotors being rotatively driven at corresponding peripheral speeds and in opposite directions, with notches in each secondary rotor registering with successive notches in the primary rotor, a feed line for feeding bottles into successive notches in the primary rotor for advancement thereby between adjacent rotors, a takeoff line associated with each rotor beyond its point of nearest adjacency with another of the rotors, means for deflecting a bottle from a notch in each rotor into the takeoff line associated with each such rotor, detector means mounted in the path of bottles being advanced in notches of the primary rotor, each detector means being mounted to detect the presence or absence of a specific physical characteristic of each bottle being advanced along such path, a plurality of deflectors equal in number to the detector means mounted in the path of bottles being advanced along such path and operatively connected one to each detector means, one deflector being mounted between, and closely beyond, the point of nearest adjacency of the primary rotor with each secondary rotor, and means urging each deflector toward one position to maintain a bottle passing the deflector in a notch in one of the rotors between which such detector is mounted, each deflector being actuated by a detecting actuation of its associated detecting means to deflect the bottle which actuates the detecting means into a notch in the other of the rotors between which such deflector is mounted.

4. A bottle sorting mechanism comprising a pair of rotors arranged in marginally adjacent relation, each of the rotors having a plurality of notches in its periphery,

each of the notches being of a size to receive a bottle in laterally seated relation therein, the rotors being driven in opposite directions at speeds to bring notches of one rotor into register with successive notches of the other rotor, means for feeding a line of indiscriminately intermixed bottles, only a portion of which have a predetermined physical characteristic, into successive notches in said other rotor, means for retaining each bottle fed into a notch in said other rotor for conveyance thereby from the feed line to a position between registering notches of both rotors, a deflector pivotally mounted between the rotors beyond their point of nearest adjacency, means normally urging the deflector to a position to deflect in one direction a bottle emerging from between registering notches in the rotors, electrical switch means operatively connected to said deflector and mounted adjacent the path of bottles being conveyed from the feed line to a position between registering notches of the rotors, said switch means being positioned to engage bottles having such predetermined physical characteristic to actuate the deflector, and to clear bottles lacking such physical characteristic, whereby the bottles having such physical characteristic are deflected one way by said deflector, and bottles not having such characteristic are deflected another way, thereby to sort out bottles having such characteristic from the others passing between the rotors.

5. A bottle sorting mechanism comprising a pair of rotors arranged in marginally adjacent relation, each of the rotors having a plurality of notches in its periphery, each of the notches being of a size to receive a bottle in laterally seated relation therein, the rotors being driven in opposite directions at speeds to bring notches of one rotor into register with successive notches of the other rotor, means for feeding a bottle into each successive notch in said other rotor, means for retaining the bottles in said notches for conveyance thereby to a position between registering notches of both rotors, a deflector mounted closely beyond the point of nearest adjacency of the rotors, means normally urging the deflector to a position to deflect a bottle emerging from between registering notches in the rotors toward one of said rotors, a detector operatively connected to said deflector and mounted adjacent the path of bottles being conveyed to a position between registering notches of the rotors, said detector being mounted to detect bottles having a predetermined physical characteristic to actuate the deflector, and to clear bottles lacking such characteristic, whereby the bottles having such characteristic are deflected into the registering notch in one of said rotors, and bottles not having such characteristic are deflected into the registering notch in the other of said rotors, thereby to sort out bottles having such characteristic from the others passing between the rotors.

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