METHOD OF AND DEVICE FOR CONVEYING AND ARRANGING EMPTY RECEPCTABLES, SUCH AS BOTTLES OR JARS

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ABSTRACT

An endless conveyor fitted with parallel open-ended troughs passing through a bin containing empty receptacles scoops up several receptacles simultaneously which then settle in the troughs with their axes aligned. Endwise advance of the receptacles along each trough causes all but one receptacle to be ejected, resulting in the formation of a single continuous row of parallel receptacles along one conveyor edge. After removal from the row the receptacles are upended, placed in converging lanes which merge to produce a continuous supply line of a capacity of several hundred receptacles per minute.

8 Claims, 8 Drawing Figures
Fig. 8
METHOD OF AND DEVICE FOR CONVEYING AND ARRANGING EMPTY RECEPTACLES, SUCH AS BOTTLES OR JARS

BACKGROUND OF THE INVENTION

Fully automated lines for the filling and packaging of hollow receptacles, such as bottles or jars, demand a continuous supply of receptacles, as an interruption of the supply necessitates a corresponding interruption of the filling or packaging operation.

In filling and packaging plants it is common practice to keep supplies of empty plastic bottles, jars, etc., in large bins and to employ an automatic feeding device for removing receptacles one by one from a bin, arranging the removed receptacles in the desired order and conveying them to the filling machine or line.

The continuity of the receptacle supply is interrupted if the element which removes receptacles from the bin fails to feed a receptacle, thus skipping a stroke or cycle of operation.

Difficulties are also experienced if the demand for receptacles is high, for example of the order of several hundred receptacles per minute. At such demand rates, as far as we are aware, intermittently operating feeding mechanisms or mechanisms employing reciprocating or oscillating elements fail to operate dependably.

SUMMARY

The present improvements are based on the consideration that a continuous dependable delivery at a high rate is obtainable by first conveying an oversupply of receptacles from a supply bin, more particularly by removing and conveying several receptacles simultaneously, followed by elimination of those receptacles which are in excess of the demand. The remaining receptacles then form in continuous unbroken flow of supply.

In carrying out this objective, we pass a conveyor comprising parallel substantially horizontally disposed troughs through a supply bin in which the receptacles are disposed in arrangement. The troughs are of sufficient length to scoop up and hold several receptacles simultaneously. The scooped-up receptacles generally settle in the troughs in a position in which their axes are parallel to the trough axis.

In the handling of receptacles of complex configuration, some receptacles may be grasped in a manner which precludes their subsequent settling in the troughs. Such receptacles are removed.

The troughs containing receptacles emerge from the bin on an upward slanted path. Preferably the slant direction is then reversed so as to conduct the troughs back over the bin. This causes improperly grasped receptacles to drop out of the conveyor means by gravity.

Substantially simultaneously the receptacles are advanced in their respective troughs towards one end of the trough and sufficiently far to cause ejection of all but one receptacle from the end of each trough. A single uninterrupted row or series of parallel receptacles remains along one lateral edge of the conveyor means.

Appropriate devices can then be employed for consecutively removing the receptacles from the single row in the conveyor means, orienting them so that all the necks or open mouths are pointed in one direction and forming a supply line in which the receptacles advance to the filling machine in single file.

By appropriate choice of the length of the troughs, having regard to the dimension and shape of the receptacles, to the exposure of the conveyor troughs to the bin, and to the ultimate numerical demand of receptacles per minute, it is therefore possible to deliver one receptacle from each and every trough of the conveyor means with great dependability.

The objects, features and advantages of this invention will appear more fully from the detailed description which follows accompanied by drawings showing, for the purpose of illustration, a preferred embodiment of the invention.

also resides in certain new and original features of construction and combination of elements, as well as certain steps and sequences of steps hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages, and a manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part of it, in which

FIG. 1 is a perspective view of a conveyor means emerging from an empty receptacle bin;

FIG. 2 shows the device of FIG. 1 in operation, the bin being partially filled;

FIG. 3 is a perspective view of the conveyor means from the opposite side of the bin;

FIG. 4 is a perspective side elevation of the conveyor;

FIG. 5 is a perspective rear view of the device;

FIG. 6 is a perspective view of the delivery station of the device and a partial view of a representative form of bottle orienting and orienting mechanism arranged to either side of the delivery station, the view being in a direction opposite to the that of FIG. 5;

FIG. 7 is a perspective view of the terminal portion of the bottle orienting mechanism at which a single line of upended bottles emerges; and

FIG. 8 is a perspective view of a bottle upending mandrel unit used in the orienting mechanism.

In the following description and in the claims various details will be identified by specific names for convenience. The names, however, are intended to be generic in their application. Corresponding reference characters refer to corresponding parts in the several figures of the drawings.

The drawings accompanying, and forming part of, this specification disclose certain specific details of construction for the purpose of explanation of broader aspects of the invention, but it should be understood that structural details may be modified in various respects without departure from the principles of the invention and that the invention may be incorporated in other structural forms than shown.

It is further to be understood that whatever is stated in the following description with respect to bottles equally applies to other forms of empty receptacles, such as jars, tubes, etc.

DESCRIPTION OF PREFERRED EMBODIMENT

The receptacle conveying and arranging device comprises a supply bin 11 (FIGS. 1 and 4) normally filled with receptacles (FIG. 2) which in the illustrated example are plastic bottles of relatively complex configuration. The bottles lie in the bin in random disorder.

A conveyor means, generally designated 13, serves to transport bottles 12 out of the bin 11.

The conveyor means comprises an upward run generally shown in FIG. 4 and a return run generally shown in FIG. 5.

The upward run may be considered as starting at the front of the bin at 14 (FIG. 4). It first follows the curved bottom 15 of the bin along a course indicated by a broken line 16 marked on the side wall of the bin and has generally upward slant in a direction towards the upper right.

At or near the top rim 17 of the bin the path of the conveyor means is curved within a zone 18, the curvature being concave as viewed from the front of the bin. Beyond the zone 18 the path of the conveyor means continues at a reverse slant towards the upper left, thus bringing the conveyor means back over the bin 11.

The upward run of the conveyor means 13 thus comprises a lower portion within the bin 11 within which the direction of ascent is toward the right, an upper portion substantially above the bin within which the direction of ascent is toward the left, and a concave reversal portion 18 approximately within the zone where the conveyor means emerges from the bin 11.
The conveyor means is fitted with open-ended troughs 19 comprising front lips 20 which point upwardly within the upward run of the conveyor means and cause the troughs to act as scoops adapted to scoop bottles from the bin (FIG. 2).

The troughs 19 are mounted on lugs 21 extending from chains 22 through slots 23 in the bottom of the bin and also in an upwardly extending slanted panel 24.

The chains 22 are best seen in FIG. 5 showing the return run of the conveyor means within which the troughs 19 are inverted and the lips 20 point downwardly.

Referring to FIG. 1, it is seen that by reason of the mounting of the troughs 19 on conveyor lugs 21 the spaces between the troughs which are relatively wide within the bin become narrower within the concave reversal zone 18. Above this zone the spacing between the troughs becomes larger again. As shall be pointed out later, the variation in spacing aids in the removal of improperly seated bottles from the conveyor means.

Advantageously the conveyor means may be composed of two conveyors 113, 213, disposed side by side, each conveyor being fitted with troughs, the troughs being aligned and both conveyors being driven at the same linear speed.

This arrangement, which may be considered a split conveyor, is by no means essential to the basic function of the device and to the practice of the basic underlying method, but it offers certain advantages in the removal of the bottles from the device at the delivery station, having regard to the particular form of removal mechanism shown in the drawings and briefly described further below.

In the illustrated preferred embodiment of the invention the conveyor means comprises a major conveyor 113 and a minor conveyor 213, the latter entering the space of the bin at a level above the bin bottom 15, this being also a matter of preference. It should be pointed out, however, that the minor conveyor 213 may also be constructed to enter the bin at or near the bin bottom, for example near the point 14 (FIG. 4) in which case the minor conveyor increases the pickup capacity of the conveyor means by about one bottle per trough.

The troughs of the illustrated major conveyor are of a length sufficient to scoop up a maximum of three bottles simultaneously while passing through the bin (see FIGS. 2 and 3). FIGS. 2 and 3 show that the conveyor means occasionally picks up bottles by their necks or by their lower body portions. Such bottles will not settle in the troughs in a position in which the bottle axis is substantially parallel to the trough axis, and require removal from the conveyor means, preferably within the reversely slanted portions of the upward conveyor run.

Considering the lowest trough visible in FIG. 2, the neck of the bottle 12' at the extreme left faces the observer. This bottle is tightly grasped between the two lowest visible troughs which are relatively narrowly spaced within the reversal area 18. The spacing however increases as the troughs enter the reversely slanted portion, and it is clearly apparent that a similarly grasped bottle 12'' in the third trough above the bottle 12' is being held only very loosely and is about to drop back into the bin. Bottles hanging by their necks, such as bottle 12''' similarly are released from the conveyor means and return to the bin.

Means are provided for advancing bottles resting in the troughs towards one end of the troughs. Such means may take a variety of forms and be disposed in different ways. For example, a finger may be associated with each rising trough, the fingers passing through a curved slot in the panel 24 to extend into the respective trough from the back. The slot extending from the lower left to the upper right causes the finger to move from left to right, thereby advancing bottles in the troughs to the right.

Alternatively, the bottle advancing means may be disposed at the front and may have the form of a transverse endless conveyor (FIG. 3) extending at an upward slant substantially diagonally across the upper reversely slanted portion of the conveyor means 13. The conveyor 25 is fitted with pushers or paddles 26 shaped to fit the spaces between adjacent troughs so as to engage and advance the bottles in each trough in the direction towards the right in FIG. 3.

The run of the transverse conveyor to which the number 25 is applied is the return run moving toward the lower left as indicated by an arrow 27 and the idle pushers 26 thereof are disengaged from the troughs by reason of the conveyor assembly 25 being set somewhat askew with regard to the panel 24 along which the troughs 19 move.

The ascending run of the conveyor is hidden behind an angle iron 28 which serves a double purpose. It acts as a guard and guide for the ascending run of the chain with its pushers and it acts as a deflecting rail for forcing improperly seated bottles, such as bottle 12'', out from between adjacent troughs.

The transverse conveyor 25 pushes the bottles in each trough far enough to eject all bottles, except the one directly engaged by a pusher 26. For this purpose a terminal sprocket wheel 29, about which the conveyor 25 is trained, is so located near the line of division 30 between the conveyor portions 113 and 213 that the pusher moving about the sprocket wheel leaves the respective bottle in a precisely defined position with respect to the lateral edge 31 of the conveyor means.

The bottle in the topmost trough in FIG. 2 had reached its final position. The bottle in the next lower trough is still being advanced. Two bottles are nested in the third trough from the top. The right bottle is about to be ejected from the trough and the bottle on the left will eventually be moved to a position in which its ends are aligned with the bottle shown in the topmost trough.

The transverse conveyor 25 is supported by the terminal sprocket wheel 29, which is an idler wheel, and a driven sprocket wheel 29' at the lower end which received its drive through drive chains 32, 33 and an angle gear 34 therebetween.

Appropriate bearings 35 and 36 for the shafts of the sprocket wheels are mounted near the ends of a supporting bar or rail 37, the upper end of which is secured to a bracket 38 welded to the top of the machine frame, the lower end being attached to the framework 39 encircling the bin 11.

Precise alignment of the bottle ends is facilitated by a short endless conveyor 44 mounted adjacent the upper portion of the lateral edge 31. The conveyor 44 is fitted with abutment blades 45 against which the mouth or the bottom, of a bottle moves. The blades 45 move upwardly at a rate substantially equal to the rate of the troughs and temporally close the end of the trough approximately at the level of the return of the transverse conveyor 25 (FIG. 3).

The troughs of the conveyor means reaching the top of the machine are emptied of bottles except for the single row of parallel bottles adjacent the right lateral edge 31, there being a bottle in each and every trough.

The empty troughs of the major conveyor 113 are visible in FIG. 5, their lips 20 being pointed downwardly.

The return run of the minor conveyor 213 is first downwardly directed at an angle of approximately 45° as shown at 40, and then continues in a vertical direction past the delivery station or zone generally designated 41.

The troughs of the conveyor means are inverted during the return run. As a consequence, the bottles 12 slide from their previous positions in a trough to a new position on the bottom of the preceding trough, which bottom surface now faces upwardly (see FIG. 6).

In order to prevent bottles from being tossed out of their respective compartments, particularly at high operating speeds, a pair of hold-down rails 42 are provided within the inclined portions 40. A single centrally disposed retaining rail 43 is provided within the vertical conveyor portion extending past the delivery zone.

The ends of the conveyor pockets or spaces passing through the delivery zone 41 are open and permit endwise removal of the bottles therefrom.

This may be accomplished in a variety of ways, a preferred manner of removal being one in which each bottle is positively removed and is at least partially separated from the other bottles as each bottle passes. This manner of removal may be accomplished in a variety of ways, as shown in FIG. 11 further.
grasped and held by its neck until it is put, down onto a carry-out conveyor.

According to the preferred procedure, particulars of which form the subject of a separate copending application, Ser. No. 45656, filed June 12, 1970, each bottle is approached from opposite ends by a pair of expandable mandrels, one of which pushes against the bottle bottom while the opposite mandrel enters the bottle neck and is expanded to grasp the bottle. The latter mandrel continues to hold the bottle while the troughs of the conveyor are retracted to release the bottle. The mandrel and bottle are then pivoted about an axis transverse to the axis of the mandrel, thereby upending the bottle which is finally put down onto a compartmented conveyor which carries it away.

The two groups of mandrel assemblies which approach the bottles from opposite sides are identical, although oppositely facing. It will for this reason be sufficient to describe only one.

Each group of assemblies is carried by a pair of parallel endless chains 46 to which bases 47 are transversely secured, comprising arms 48 (see also FIG. 8).

A substantially cross-shaped tilt body 49 is pivotally supported by the arms 48 between pivots 50 defining a tilt axis.

The body 49 has a longitudinal bore through it within which a hollow stem 51 is longitudinally slideable. One end of the stem carries an expandable mandrel 52, the opposite end carries a cross head 53 comprising rollers 54 which straddle an endless guide rod alongside the course of the conveyor chains 46.

It is readily seen that approach of the guide rod 55 towards the conveyor 46 causes the stem 51 and mandrel 52 to move towards the left, thereby extending the mandrel towards a bottle. Increasing distances of the guide rod 55 from the chains 46 cause retraction of the mandrel 52 by movement of the stem 51 to the right.

Assuming next that the guide rod 55 were disposed at a constant distance from the chains 46 but that the plane within which the guide rod 55 lies were to change relatively to the plane within which the adjacent chain portion lies, the result would be a tilt of the body 49 about its tilt axis 50. Various degrees of such tilt can be seen in Fig. 7.

It is thus possible by appropriate changes in the curvature and distance of the guide rod 55 with respect to the course of the conveyor assembly 46, 47 to extend or retract and simul-taneously tilt the mandrel, and to produce corresponding movement of the bottles grasped by the mandrel.

The mechanical action by means of which the mandrel is expanded and contracted is briefly as follows:

Expansion of the body for the purpose of grasping a bottle is effected by two laterally serrated blades 56 which are projectable from and retractable into, longitudinal slots 57 in the mandrel 52. The blades are normally retracted, and may be projected by movement of a transverse pin of bolt 58 in the direction of the stem 51.

The stem 51 of the mandrel is slotted at 59, and an internal spring (not visible) normally maintains the pin 58 against the forward end of the slot in the stem. The stem slot registers with a longer slot 60 in the cross shaped body 49 and the pin 58 is long enough to engage the ends of the slot 60. Movement of the stem 51 in a direction to project the mandrel moves the pin 58 to the end of the slot 60 in the tilt body, and further movement of the stem causes the stem 51 to advance in relation to the pin which is now arrested by the forward end of the body slot.

The advance of the stem in relation to the cross pin amounts to a retraction of the cross pin relatively to the stem and causes the mandrel blades 56 laterally to emerge from the mandrel, thus grasping the bottle into the neck of which the mandrel was inserted.

Returning now to FIG. 6, it is seen that the second mandrel assembly from the top is being projected by the guide rod 55 towards a bottle whose bottom surface faces the mandrel. The mandrel therefore is about to displace the bottle slightly to the left where an oppositely facing mandrel of the far conveyor-and-mandrel assembly enters the bottle neck.

The mandrel of the third assembly from the top in FIG. 6 has entered the neck of the bottle. Its stem has been displaced to the left, as is apparent from a comparison of the lengths of the exposed stem portion and of the assembly directly above. It is also seen that its pin 58 has reached the end of the slot 60 in the tilt body, thus causing the mandrel to grasp and hold the bottle by its neck.

The bottommost bottle in FIG. 6 is firmly held by the corresponding mandrel which is about to move away in a direction to the lower right while the conveyor troughs are about to move away towards the lower left by reason of the fact that the chains 61 of the conveyor are trained around the sprocket wheel 62 visible at the lower left.

In FIG. 7, sequential positions of the bottles are identified by a corresponding number of dots on the respective bottles.

The first bottle was just removed from the conveyor space in which it had rested and is beginning its downward swing. The mandrel which had acted on its bottom is visible on the right next to the bottle.

The second bottle has assumed an inclination of about 30 degrees.

The third bottle had been reversely oriented and is being handled by the mandrel-conveyor assembly on the right. The corresponding mandrel on the left is vacant.

The fourth bottle has been released and seated between bars 63 of a conveyor moving towards the observer. The conveyor space in front of the fourth bottle is vacant, but the fifth bottle occupies the corresponding space on the opposite side.

The bottles are guided along lanes 64, 65 towards a point of merger 66 where the bottles merge into a continuous line without mandrel interference as, due to the operation of the device, presence of a bottle in one lane, such as 64, between any two transport bars is matched by a vacant space in the other lane 65 between the same two transport bars.

After release of the bottles the mandrel stems are retracted (compare mandrels of the fifth and sixth bottle) and are swung into horizontal position for return to the station 41.

DRIVE

The drive motor is located under the bottle orienting mechanism and lies beyond the margin of FIG. 4. From the motor a drove chain 67 extends to a lower transverse shaft 68 from which the bottle orienting mechanism is driven via a chain 69.

A further chain 70 extends upwardly to drive an upper transverse shaft 71 from which the short chain 72 extends to a shaft 73 of the abutment conveyor 44 (FIG. 3). The upper transverse shaft 71 has the sprocket wheels keyed to it over which the major and minor conveyors 113, 213 are trained.

One such sprocket wheel 74 is visible in FIG. 5. The end of the shaft 71 carries a sprocket wheel 75 from which the drive chain 33 of the transverse conveyor 29 extends.

An idler shaft 76 near the bottom of FIG. 5 carries sprocket wheels 77 about which the return run of the conveyor 113 is trained.

CHANGES IN RECEPACBLE SIZE AND SHAPE

A unique feature of the conveying and arranging machine is that it requires practically no adjustments nor adaptations if receptacles of different dimensions are to be conveyed.

Any bottles or jars that fit into and can be carried by the troughs can be handled. The receptacle may be short or tall, it may be of circular, oval, rectangular, hexagonal or any other cross sectional shape. The presence or absence of a neck is immaterial. Only if extreme variations in average diameter are encountered, the retaining rail 43 at the delivery station may be set closer to, or farther away from, the lips 20 of the troughs to insure a fair degree of centering, enough for the mandrels to find the neck or mouth of the receptacle. The delivery capacity of the machine is variable by means of a variable transmission associated with the drive motor.
SUMMARY OF OPERATION

Parallel troughs of a continuous conveyor (FIG. 2) pass through a bin containing bottles in random disorder and scoop up several bottles, on the average, by each trough. Endwise advance of the bottles along each trough causes elimination of all but one bottle from each trough, leading to formation of an uninterrupted row of parallel bottles along one margin of the conveyor.

The single row passes through a delivery station (FIG. 6) where the bottles are removed by their necks, are then upended (FIG. 7) and placed in two converging conveyor lanes which merge and produce an uninterrupted line of supply of bottles capable of very high delivery rates.

What is claimed is:

1. The method of continuously conveying and arranging empty receptacles, such as bottles or jars, the method comprising passing in an upwardly slanted direction substantially horizontally disposed parallel troughs of a conveyor means through the lower portion of a space containing said receptacles in random arrangement to effect formation in said troughs of parallel rows of receptacles disposed end to end, thereafter guiding said conveyor means and receptacles on a further ascending, reversely slanted path back over said space and simultaneously advancing the receptacles in each trough endwise sufficiently far to eject all but one receptacle from each trough to effect formation on said conveyor means of a single row of receptacles having their ends aligned; thereafter guiding that portion of said conveyor means which carries said parallel disposed receptacles on a path which diverts from the path of the remainder of said conveyor means in a zone downstream from the zone of receptacle transfer, and removing successively the receptacles from said conveyor means portion in said downstream zone.

2. A method of continuously conveying and arranging empty receptacles, such as bottles or jars, the method comprising passing in an upwardly slanted direction substantially horizontally disposed parallel troughs of a conveyor means through the lower portion of a space containing said receptacles in random arrangement to effect formation in said troughs of parallel rows of receivers disposed end to end, thereafter guiding said conveyor means and receptacles on a further ascending, reversely slanted path back over said space and simultaneously advancing the receptacles in each trough endwise sufficiently far to eject all but one receptacle from each trough to effect formation on said conveyor means of a single row of receivers having their ends aligned; thereafter guiding that portion of said conveyor means which carries said parallel disposed receivers on a path which diverts from the path of the remainder of said conveyor means; removing successively the receivers from the receiver-carrying conveyor portion by endwise moving said receivers in one or the opposite direction, depending on the orientation of the mouth of the respective receiver; then upending said receivers and forming two lanes of the upended receivers by guiding receivers removed in one direction into one lane and receivers removed in the opposite direction into the other lane to effect formation of two discontinuous lanes of receivers in the sense of presence of a receiver in one lane corresponding to absence of a receiver in the other lane; continuously advancing said two lanes of receivers towards a zone of merger and finally merging said two lanes into a single continuous lane.

3. A device for conveying and arranging empty receptacles, such as bottles or jars, the device comprising in combination a storage bin having an upwardly inclined bottom, an endless feed conveyor means comprising successive parallel substantially horizontally disposed troughs of a length sufficient to accommodate more than two receptacles disposed end to end in each trough, the conveyor comprising an upward run in which the troughs face upwardly and a downward return run in which the troughs are inverted, a portion of the upward run passing above said bin bottom to scoop up in its troughs receivers stored in said bin; said conveyor being composed of two parallel portions, the major portion of which comprises troughs of a length to accommodate at least two receptacles end to end, and the minor portion of which comprises troughs of a length to accommodate a single receptacle end to end, said transverse conveyor disposed diagonally across a portion of said upward run, said transverse conveyor comprising lugs extending into the spaces between successive troughs of said feed conveyor in a position endwise to engage receptacles in said troughs and to advance them lengthwise of said troughs from said major conveyor onto said minor conveyor, the transverse conveyor being so disposed in relation to one lateral edge of said minor conveyor as to eject all but one receptacle from each trough to effect placement of said one receptacle remaining in the trough in a single row of parallel receptacles adjacent said lateral edge; means for driving said transverse conveyor in timed relationship to said feed conveyor, such as to maintain said lugs in mesh with the spaces between said troughs; and means within the return run of said feed conveyor for successively removing the receptacles from said minor conveyor.

4. A device for conveying and arranging empty receptacles, such as bottles or jars, from a storage station at which the receptacles are disposed in random arrangement in a bin to a delivery station at which the receptacles are spaced, at which their axes are parallel, and at which their ends are aligned, the device comprising, an endless conveyor means comprising successive parallel evenly spaced troughs, each trough being sufficiently wide to accommodate a plurality of receptive ends end to end, the conveyor means comprising an upward run within which the troughs face upwardly and a return run within which the troughs face predominantly downwardly, the upward run being guided to present, in side view, a lower upwardly slanted portion within the area of said bin within which the troughs are in a position to scoop up receptacles resting in said bin, an upper reversely upwardly slanted portion substantially vertically above the said lower portion, and an intermediate concavely curved portion between said upper and said lower portion; a transverse conveyor extending at an upward slant transversely across said upper reversely slanted portion of said conveyor means, said transverse conveyor comprising lugs extending into the spaces between successive troughs in a position to engage and endwise advance receptacles resting in said troughs, said transverse conveyor being of such length and so disposed as to expel from one end of each trough all the receptacles therein except the one receptacle remaining in said troughs forming a single row of parallel receptacles having their ends aligned; and removal means for removing from said row the receptacles in successive troughs.

5. A device as defined in claim 4 in which an upwardly slanted bar extends across said upper portion in advance of said transverse conveyor, said bar being sufficiently close to said troughs to engage receptacles caught between, and protruding from, successive troughs.

6. A device for conveying and arranging empty receptacles, such as bottles or jars, from a storage station at which the receptacles are disposed in random arrangement in a bin to a delivery station at which the receptacles are evenly spaced, at which their axes are parallel, and at which their ends are aligned, the device comprising a minor and a major conveyor driven at the same linear rate, each conveyor being fitted with successive parallel evenly spaced troughs, the troughs of the minor conveyor being of a length adapted to hold a single receptacle only, the troughs of the major conveyor being at least double the length of the troughs of the minor conveyor, each conveyor comprising an upward run within which the troughs face predominantly upwardly, and a return run within which the troughs face predominantly downwardly, the upward run of the major conveyor being in side view, a lower upwardly slanted portion within the area of said bin within which the troughs are in a position to scoop up receptacles resting in said bin, an upper reversely upwardly
slanted portion substantially vertically above the said lower portion, and an intermediate concavely curved portion between said upper and said lower portion; the said minor conveyor being disposed alongside said major conveyor within at least the upper portion thereof and in such manner that the troughs of both conveyors are in sufficient alignment for transfer of receptacles from said major to said minor conveyor; a transverse conveyor extending transversely and upwardly across the said upper portion of said major conveyor, said transverse conveyor comprising lugs extending into the spaces between successive troughs in a position to engage and endwise advance towards said minor conveyor receptacles in the troughs of said major conveyor, said transverse conveyor terminating at a point approximately at the junction of the major and minor conveyors, the point being so selected as to effect removal from the troughs of the major conveyor the respective one receptacle directly engaged by a lug and transfer of said one receptacle onto the aligned trough of said minor conveyor, the course of the minor conveyor deviating from the course of the major conveyor at a zone downstream with respect to the zone of transfer to expose both ends of the troughs of the minor conveyor; and removal means disposed at both ends of the troughs of the minor conveyor within the zone of deviation for endwisely removing the receptacles from successive troughs of the minor conveyor.

7. A device as defined in claim 6 in which an upwardly slanted bar extends across the said upper portion of the major conveyor, said bar being sufficiently close to the troughs of the major conveyor to engage receptacles caught between, and protruding from, successive troughs.

8. A device as defined in claim 6 in which the said zone of deviation of the conveyors is within the return run of both major and minor conveyors and in which a rail is provided substantially parallel to the minor conveyor across the face of its troughs for retaining receptacles in the spaces between successive downwardly facing troughs.