

Sept. 13, 1966

W. ROTH

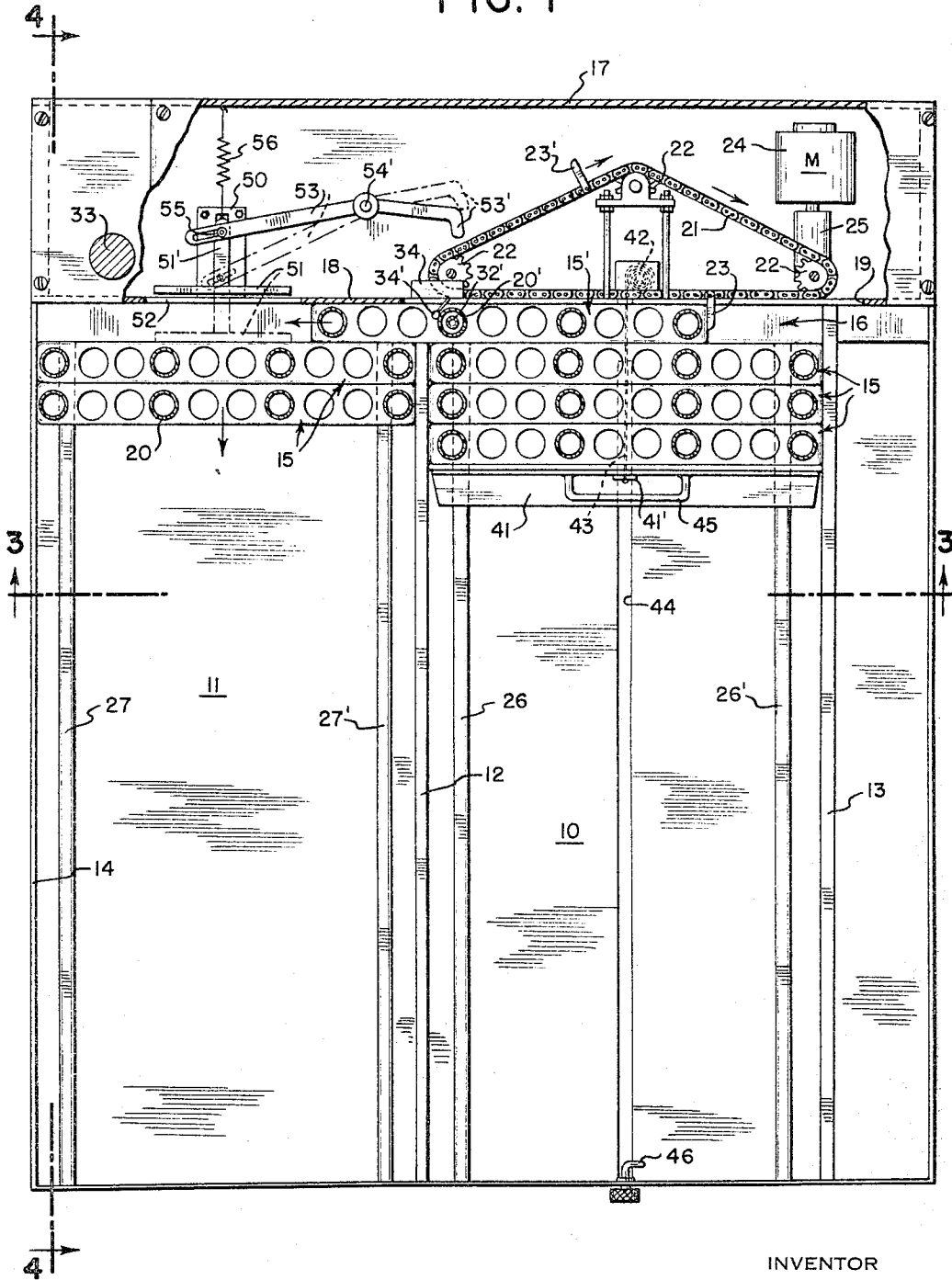
3,272,240

CONTAINER FILLING TRANSFER MECHANISM

Filed Nov. 15, 1963

3 Sheets-Sheet 1

FIG. 1



INVENTOR

Wilfred Roth

BY

Benjamin Edmund Morton Taylor & Williams
ATTORNEYS

Sept. 13, 1966

W. ROTH

3,272,240

CONTAINER FILLING TRANSFER MECHANISM

Filed Nov. 15, 1963

3 Sheets-Sheet 2

FIG. 2a

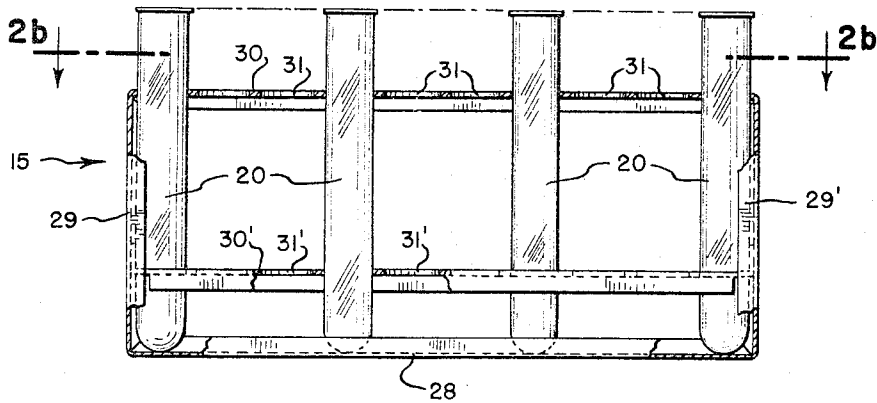


FIG. 2b

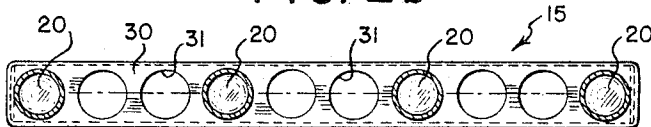
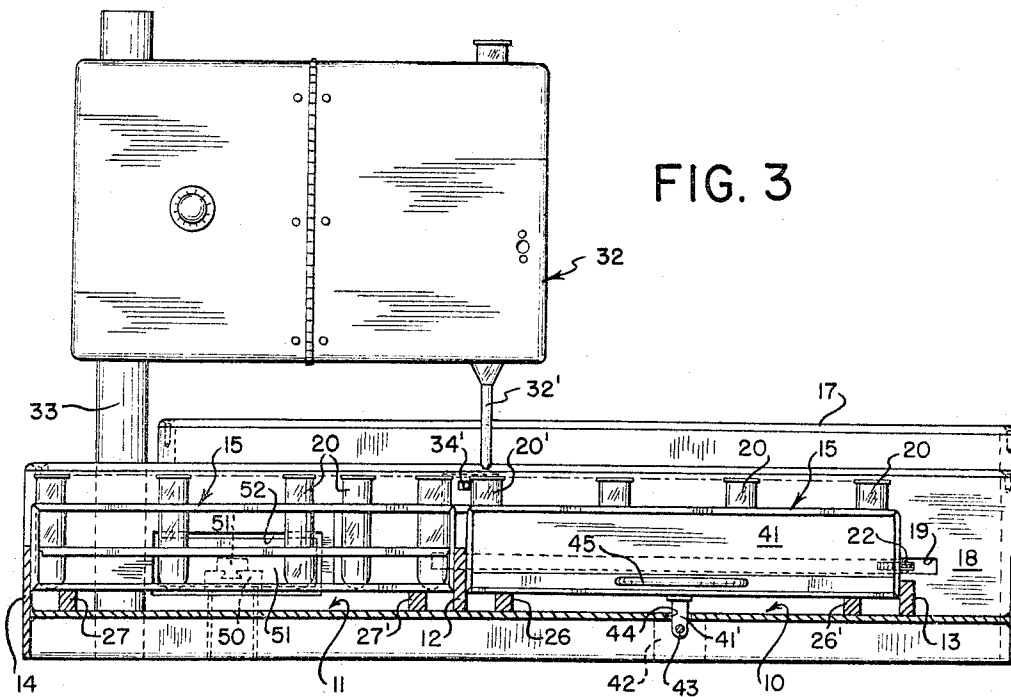


FIG. 3



INVENTOR
Wilfred Roth

BY
Emmie Edmunds Martin Taylor Adams
ATTORNEYS

Sept. 13, 1966

W. ROTH

3,272,240

CONTAINER FILLING TRANSFER MECHANISM

Filed Nov. 15, 1963

3 Sheets-Sheet 3

FIG. 4

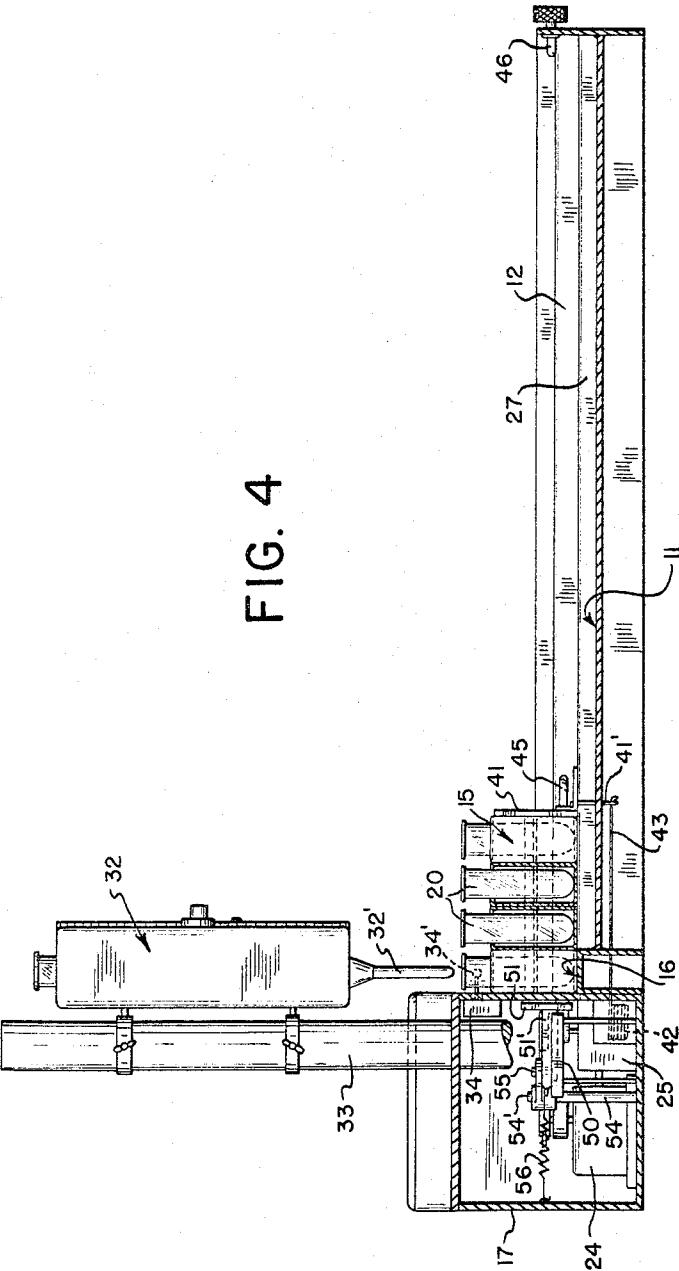
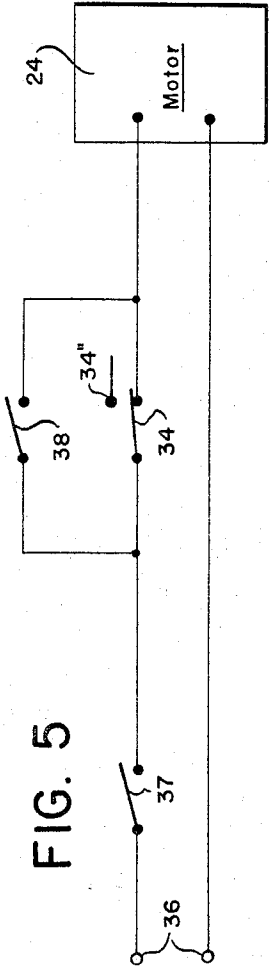


FIG. 5



INVENTOR
Wilfred Roth
BY
James Edmund Martin Taylor Colman
ATTORNEYS

1

3,272,240

CONTAINER FILLING TRANSFER MECHANISM
Wilfred Roth, 58 Brainard Road, West Hartford, Conn.
 Filed Nov. 15, 1963, Ser. No. 323,947
 8 Claims. (Cl. 141-176)

This invention relates to a transfer mechanism for containers to be filled, for example, test tubes and the like.

Automatic transfer apparatus is frequently desired in order to facilitate the filling of a large number of containers with liquid, granules, tablets and the like. The containers may be test tubes, vials, bottles, etc. One example is a fractionator wherein it is desired to fill a considerable number of test tubes with a measured quantity of liquid.

The present invention provides a transfer mechanism of this type wherein the test tubes or other containers to be filled are held in individual racks designed to accommodate a given number of containers. The racks are then placed in a rack tray having side-by-side input and output channels with a transfer section at one end of the tray. Drive means successively transfer racks along the transfer section from the input channel to the output channel, and indexing means interrupt the movement of a given rack along the transfer section as each container therein arrives at a predetermined filling point. Means are provided for moving the racks in the input channel toward the transfer section as each leading rack is transferred out of the way, and for moving transferred racks away from the transfer section into the output channel.

Advantageously the indexing means is actuated by a control member positioned to be contacted by each test tube or other container as it reaches the filling point. Thus the container itself determines the point at which the rack movement is interrupted, and cumulative errors in the positioning of a given container at the filling point are avoided.

By suitable choice of the length of the rack tray, any desired number of racks may be accommodated at one time. Further, by removing racks from the output channel and adding racks to the input channel, an indefinitely large number of containers may be indexed successively past the filling point.

The invention will be described in connection with a specific embodiment thereof shown in the accompanying drawings, in which:

FIG. 1 shows a top view, partly in section, of a transfer mechanism in accordance with the invention, particularly designed for test tubes;

FIG. 2a is a side view partially in cross-section of an individual tube rack, and FIG. 2b is a top view thereof;

FIG. 3 is a cross-sectional view taken along the line 3-3 of FIG. 1;

FIG. 4 is a cross-sectional side view taken along the line 4-4 of FIG. 1; and

FIG. 5 is a schematic of a suitable electrical circuit.

Referring to FIG. 1, a rack tray is shown having side-by-side input and output channels 10 and 11 separated by partition 12. The outer sides of the channels are formed by guide rails 13 and 14. A plurality of racks 15 are movably supported in side-by-side relationship in the channels.

A transfer section 16 is arranged at one end of the rack tray and extends across the input and output channels. Thus, side rails 13 and 14 extend across the transfer section and form the outer boundaries thereof, but partition 12 stops short of the transfer section. Accordingly, a leading rack in the input channel 10 may be transferred to the output channel 11, as illustrated by rack 15'.

Drive means are provided for effecting the transfer, mounted in housing 17 at one end of the rack tray. In this embodiment the drive means is an endless chain loop

2

21 traveling over pinions 22 which are mounted in bearing blocks attached to the front plate 18 of the housing. The chain carries lugs 23, 23' attached thereto by the chain pins. The material of the lugs may be selected as desired, nylon having been found satisfactory in one embodiment. A slot 19 in the front plate 18 allows the lugs to project therethrough when in driving position. A motor 24 drives one pinion through a reduction gear box 25.

In the position shown, lug 23 is in engagement with the end of rack 15' in order to move it from right to left, as indicated by the arrow. The separation of the pinions adjacent front plate 18 is selected, together with the length of the lugs, so that a lug may push a rack completely to the left and then pass around the left hand pinion 22. The flexibility of the chain avoids an excessively close tolerance in this respect. With the triangular arrangement of pinions shown, and two flight lugs equally spaced on the chain, one lug will move away from the transfer section before the next lug moves thereon. Thus a transferred rack can be moved into the output channel before transfer of the subsequent rack begins, as will be described later.

FIGS. 2a and 2b illustrate a suitable rack. Here the rack 15 has a bottom portion 28, upright end portions 29, 29' and a pair of horizontal apertured plates 30, 30'. The plates have aligned holes 31, 31' arranged in a row to support a desired number of test tubes 20. In the embodiment shown, each rack will support a row of ten test tubes. Normally each rack will be completely filled, but only four test tubes are here shown, for convenience of illustration. Advantageously the distance from either end of the rack to the center of the adjacent hole is one-half the center-to-center spacing of the holes. As shown, the rack is constructed of sheet metal, but plastic, etc. may be employed if desired.

As shown in FIG. 1, a plurality of racks are arranged to slide longitudinally of the channels. Since in this embodiment the racks have flat bottoms, raised slideways 26, 26' and 27, 27' are provided in the input and output channels to allow easier sliding.

Indexing means are provided for controlling the drive means to interrupt the movement of a rack along the transfer section 16 as each test tube arrives at a predetermined filling point. FIGS. 3 and 4 show a filling mechanism 32 mounted on a post 33 near the transfer section of the apparatus. The filler 32 has an outlet 32' through which a measured quantity of liquid, granules or the like may be delivered to the test tube thereunder. Many filling devices are known in the art, and since the details thereof form no part of the present invention, further description is unnecessary.

Referring back to FIG. 1, the outlet 32' of the filler is shown in cross-section, and test tube 20' is shown in vertical alignment thereunder. A switch 34 is mounted on the front plate 18 of the housing, and has an actuating member 34' extending through an aperture in plate 18 in position to engage a test tube when it reaches the predetermined filling point under outlet nozzle 32' and stop the drive motor 24.

Referring to FIG. 5, a motor 24 is connected to receive power from the mains 36. Switch 37 is a master on-off switch. Switch 34 is the switch which serves to stop the rack as each test tube reaches the filling point. Switch 34 is normally closed, but is opened to break the motor circuit upon arrival of a given test tube at the filling point. Friction and the load of the reduction gear on the motor may be relied upon for quick stopping of rack movement when switch 34 opens, or a brake may be employed if desired.

A switch 38 is in parallel with switch 34. It is normally open, but is closed when the filling of a given test tube has been completed, thereby energizing motor 24 to

resume the feeding of the rack. Switch 38 is arranged to reopen before the next test tube reaches the filling point, so that switch 34 resumes control to stop the rack movement at the proper point. The location and functioning of switch 38 may be arranged to suit the requirements of the particular application. For example, it may be contained in the filling apparatus 32 and arranged to be closed when a given quantity of liquid has been dispensed to a given test tube. Or, it could be manually operated. Spring biasing and a time delay may be incorporated in the switch actuating mechanism so that it will automatically reopen before the next test tube reaches the filling point.

The filling operation may be manually controlled or automatic, as desired for the particular application. For automatic operation the actuation of filler 32 will be controlled to occur as each test tube is stopped at the predetermined filling point. The actuation of switch 34 may be used for the purpose, for example, by communicating with contact 34' to supply power to operate suitable means (e.g. solenoid) in the filler 32, or other suitable means may be provided.

Referring back to FIG. 1, after the last test tube in a given rack has been filled, the next actuation of motor 24 will move the rack fully to the left, in alignment with the output channel 11. This provides room for the next succeeding rack in the input channel 10 to move onto the transfer section 16. Suitable means are provided for moving racks in the input channel toward the transfer section as each leading rack is transferred to the output channel.

In the specific embodiment here shown, a rack holder 41 slidably mounted in the input channel is arranged to be spring-biased toward the transfer section by a spring 42, advantageously of the constant tension type. The spring tension is applied to the rack holder by a flexible wire 43 (FIG. 4) running under the input channel and connected to a downwardly extending lug 41' of the rack holder. Lug 41' moves in a slot 44 in the bottom of the input channel 10. Thus the rack holder holds the unfilled racks in alignment against the front plate 18 of housing 17 and, when a given rack has been moved entirely to the left, the succeeding rack is pushed onto the transfer section 16. Slot 44 advantageously is terminated short of the transfer section 16, so that the rack holder is not allowed to move thereon.

A handle 45 permits the rack holder to be pulled back so that additional racks may be inserted in the input channel. A latch 46 is mounted on the rear wall of the rack tray to engage handle 45 and hold the rack holder in its rearmost position so as to facilitate initially placing racks in the input channel.

Means are also provided for successively moving transferred racks away from the transfer section into the output channel 11. In the specific embodiment shown, a pusher is employed having a front plate 51 and a bar 51' attached perpendicularly thereto. The pusher is slidably supported on member 50, as by a tongue and groove connection, and member 50 is suitably mounted in housing 17. Pusher plate 51 is aligned with an aperture 52 in the front plate 18 of the housing. Lever 53 is pivoted at 54' on a column 54 (FIG. 4) and is connected to pusher bar 51' by a pin and slot connection 55 which allows rectilinear movement of pusher plate 51 as the lever arm rotates from the position shown in full lines to that shown in dotted lines.

In order to actuate the lever 53 at the proper time, the end 53' of the lever is arranged to be contacted by one of the flight lugs 23, 23' as it moves thereby, thus moving the lever arm to the dotted position. Accordingly, when a given flight lug, say 23, has pushed a given rack 15' fully to the left, it will continue around the adjacent pinion 22 and then engage the end 53' of the lever arm to move the pusher plate 51 forward. The relative lengths of the arms and the movement thereof are selected so that the forward movement of the pusher is sufficient to push the

rack off the transfer section into the output channel 11, thereby providing room for the transfer of the succeeding rack. As soon as a given flight lug 23, 23' has passed the lever end 53', spring 56 retracts the pusher. The spacing of the flight lugs is selected so that a transferred rack is pushed off the transfer section 16 into the output channel before the next lug engages the succeeding rack from the input column to start the transfer thereof.

In operation, rack holder 41 is pulled to the rear of the input channel 10 and secured by latch 46. The desired number of racks 15, loaded with empty test tubes, are placed in the input channel and latch 46 released. Spring 42 pulls rack holder 41 forward so that the racks are held in side-by-side relationship against the wall 18 of the housing, the leading rack being on the transfer section 16. For this loading operation, lugs 23, 23' should be out of the way, either as a result of a previous operation or by momentarily closing master switch 37 (FIG. 5) prior to the loading of the racks.

When the loading has been completed, master switch 37 may be closed and the transfer operation started. Depending upon the exact position of switch 34 with respect to the leading rack from the input column, switch member 34' may or may not be contacted to open switch 34. If not, a slight movement of the rack to the left will cause the switch to open. The filling of the first test tube may then be done manually or by a suitable automatic control. When the first test tube is filled, switch 38 will be closed either manually or automatically to restart motor 24, thereby starting the transfer of the leading rack toward the left. Switch 38 opens before the next test tube contacts lever arm 34' so that the opening of the switch 34 will again interrupt the transfer of the rack.

This procedure will be repeated until the leading rack has been transferred completely to the left, away from the front of the input channel. This will allow the next rack in the input channel to move onto the transfer section 16. As the flight lug 23 continues its movement, it engages end 53' of the lever arm, thereby advancing pusher plate 51 to push the transferred rack away from the transfer section into the output channel 11. This then provides room for the intermittent transfer of the next rack.

The transfer operation may be allowed to proceed until all the racks have been transferred into the output channel and the operation then stopped. Or, if desired, during the course of the feeding, racks may be removed from the output channel and additional racks placed in the input channel until the desired number of test tubes have been filled. If the order of filling is required for subsequent operations, the racks may be suitably keyed.

The invention has been described in connection with a specific embodiment thereof. It will be understood that modifications may be made in the means for moving racks in the input channel toward the transfer section, in the transfer means, in the means for moving racks from the transfer section into the output channel, etc., as desired for a particular application.

I claim:

1. A transfer mechanism for containers to be filled by filling means at a filling point which comprises
 - (a) a plurality of container racks for supporting respective rows of containers,
 - (b) a rack tray having side-by-side input and output channels for movably supporting said container racks in side-by-side relationship therein,
 - (c) a transfer section at one end of said rack tray extending across said input and output channels,
 - (d) drive means at said transfer section for successively transferring therealong racks received from the input channel,
 - (e) indexing means for controlling said drive means to interrupt the movement of a rack along said transfer section as each container therein arrives at a predetermined filling point therealong,

5

(f) means for moving racks in said input channel toward said transfer section after each leading rack is transferred away from the front of the input channel,

(g) and means for successively moving transferred racks away from said transfer section into said output channel.

2. A transfer mechanism for containers to be filled by filling means at a filling point which comprises

(a) a plurality of container racks for supporting respective rows of containers,

(b) a rack tray having side-by-side input and output channels for movably supporting said container racks in side-by-side relationship therein,

(c) a transfer section at one end of said rack tray extending across said input and output channels,

(d) drive means at said transfer section for engaging racks received from the input channel and moving the racks successively along the transfer section to alignment with the output channel,

(e) indexing means for controlling said drive means to interrupt the movement of a rack along said transfer section,

(f) said indexing means including a control member positioned to engage the containers in a rack as the containers successively arrive at a predetermined filling point to interrupt movement thereof,

(g) means for moving racks in said input channel toward said transfer section after each leading rack is transferred away from the front of the input channel,

(h) and means for successively moving transferred racks away from said transfer section into said output channel.

3. A transfer mechanism for containers to be filled by filling means at a filling point which comprises

(a) a plurality of container racks for supporting respective rows of containers,

(b) a rack tray having side-by-side input and output channels for movably supporting said container racks in side-by-side relationship therein,

(c) a transfer section at one end of said rack tray extending across said input and output channels,

(d) an endless loop drive mechanism at said transfer section having lug means adapted to engage racks received from the input channel and move the racks successively along the transfer section to alignment with the output channel,

(e) a switch having an actuating member mounted to engage successively the containers in a rack as the rack is moved along said transfer section,

(f) said switch being connected with said drive mechanism to stop rack movement as each container engages said actuating member and thereby stop the containers successively at a predetermined filling point,

(g) means for restarting said drive mechanism after the filling of a container,

(h) means for moving racks in said input channel toward said transfer section after each leading rack is transferred away from the front of the input channel,

(i) and means for successively moving transferred racks away from said transfer section into said output channel.

4. Apparatus in accordance with claim 3 in which said means for moving racks in the input channel toward the transfer section comprises

(a) a rack holder mounted in said input channel for engagement with the rearmost rack therein,

(b) and means for moving said rack holder toward said transfer section after said transfer of each leading rack.

6

5. Apparatus in accordance with claim 3 in which said means for moving transferred racks away from the transfer section comprises

(a) a pusher mounted in front of said output channel for movement across the transfer section,

(b) and means for advancing said pusher across the transfer section to push a transferred rack into said output channel and retracting the pusher thereafter.

6. A transfer mechanism for containers to be filled by filling means at a filling point which comprises

(a) a plurality of container racks for supporting respective rows of containers,

(b) a rack tray having side-by-side input and output channels for movably supporting said container racks in side-by-side relationship therein,

(c) a transfer section at one end of said rack tray having a bottom extending across said input and output channels and a wall perpendicular to said channels for guiding racks along the transfer section,

(d) an endless loop and a driving motor coupled thereto,

(e) said endless loop being mounted behind said transfer section and having lug means extending in front of said wall to engage container racks received successively from the input channel and move the racks successively along the transfer section to alignment with the output channel,

(f) a switch having an actuating member mounted to engage successively the containers in a rack as the rack is moved along said transfer section,

(g) said switch being connected to stop said driving motor as each container engages said actuating member and thereby stop the containers successively at a predetermined filling point,

(h) means for restarting said driving motor after the filling of a container,

(i) means for moving racks in said input channel toward said transfer section after each leading rack is transferred away from the front of the input channel,

(j) and means for successively moving transferred racks away from said transfer section into said output channel.

7. Apparatus in accordance with claim 6 in which said means for moving container racks in the input channel toward the transfer section comprises

(a) a rack holder mounted in said input channel for engagement with the rearmost container rack therein,

(b) and spring means for biasing said rack holder toward said transfer section to hold the container racks in side-by-side alignment with the leading rack against said wall of the transfer section.

8. Apparatus in accordance with claim 6 in which said means for moving transferred container racks away from the transfer section comprises

(a) a pusher mounted in front of said output channel for movement across the transfer section,

(b) lever means coupled to said pusher and mounted for actuation by a lug on said endless loop to advance the pusher and push a transferred rack into the output channel,

(c) and means for retracting said pusher after advancement by a lug.

References Cited by the Examiner

UNITED STATES PATENTS

1,246,454	11/1917	Newmark	214—16.14
2,152,970	4/1939	Ness	198—24
2,973,609	3/1961	Morgan	141—234 X

FOREIGN PATENTS

378,221	7/1964	Switzerland.
---------	--------	--------------

LAVERNE D. GEIGER, *Primary Examiner.*

75 H. BELL, *Assistant Examiner.*