Jan. 12, 1954 J. HOHL ET AL 2,665,697

ARTICLE SPRAYING MEANS AND SCREW-TYPE ARTICLE-CONVEYING MECHANISM

Original Filed July 16, 1949 2 Sheets-Sheet 1

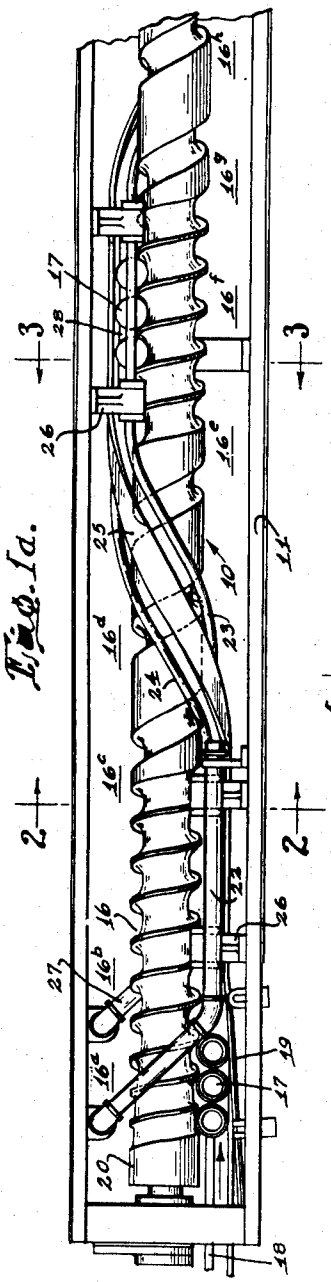


Fig. 1a.

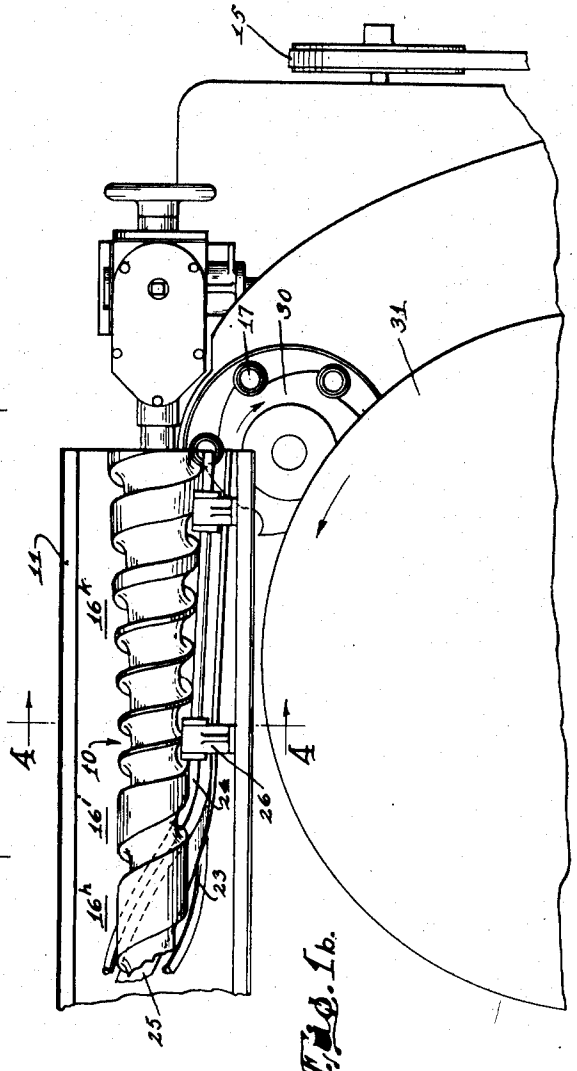


Fig. 1b.

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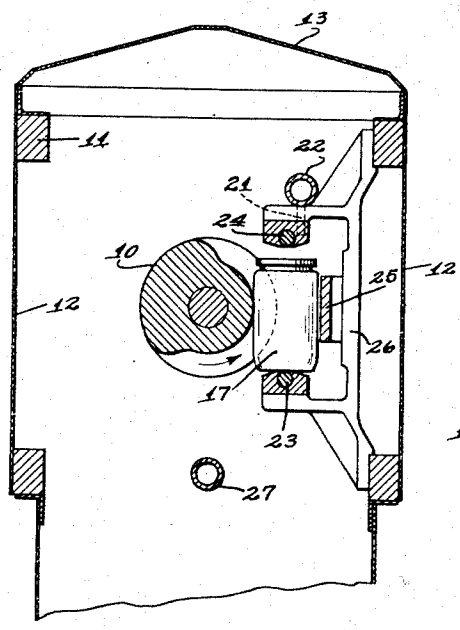


Fig. 2.

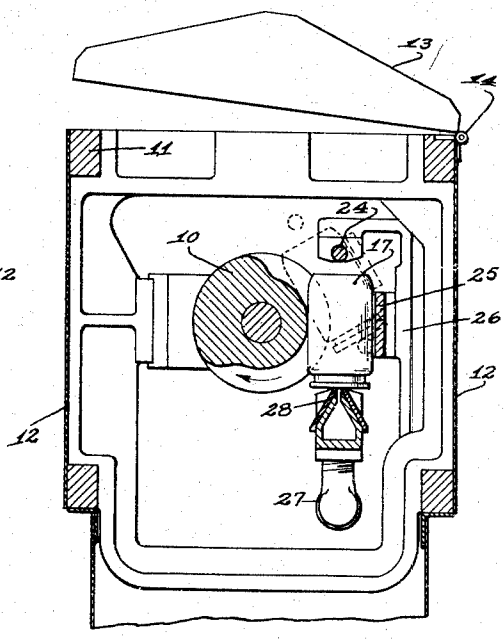


Fig. 3.

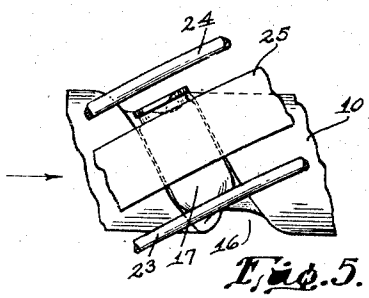


Fig. 5.

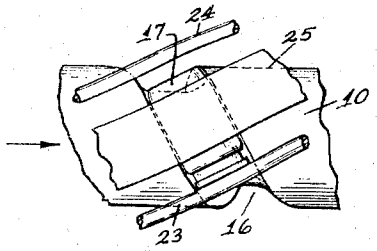


Fig. 6.

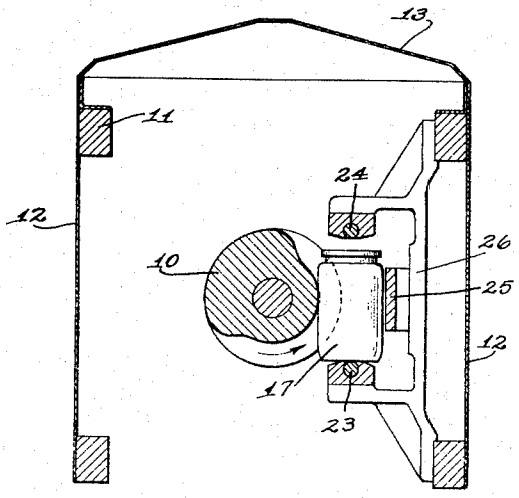


Fig. 4.

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ARTICLE SPRAYING MEANS AND SCREW-TYPE ARTICLE-CONVEYING MECHANISM

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Original application July 16, 1949, Serial No. 105,126, now Patent No. 2,604,200, dated July 22, 1952. Divided and this application July 9, 1952, Serial No. 297,818

3 Claims. (Cl. 134—65)

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Our invention relates to a screw-type conveyor mechanism for conveying open-mouth jars or other articles from one point to another and cooperating means for washing or rinsing the interior of the articles as they are advanced by the conveyor.

The present application is a division of our application Serial Number 105,126, filed July 16, 1949, now Patent No. 2,604,200, entitled "Screw-type Article-Conveying Mechanism."

The invention provides a horizontally disposed, continually rotating screw conveyor combined with means for presenting the jars in upright position to the conveyor and causing them to be advanced by the rotation of the conveyor, introducing water or other liquid into jars, inverting the jars as they advance along the conveyor and thereafter reinverting the jars to upright position before they are released from the conveyor.

A feature of the invention relates to the variation in the pitch of the spiral trough or channel in which the articles are held during their advance along the conveyor and particularly in increasing the pitch of the portion of the channel within the article-inverting zone and thereby accelerating the speed of the jars and maintaining a comparatively high speed while they are passing through the inverting zone. The construction permits a rapid inverting movement of the jars during which the rinsing water is forceably and rapidly ejected by the combined action of centrifugal force and gravity. As the jars are completing the inverting movement, the speed is again reduced by decreasing the pitch of the spiral channel.

While the inverted jars are advancing at the reduced speed, they are subjected to a rinsing operation by upwardly directed jets of water supplied through suitably arranged nozzles. Beyond the rinsing zone the pitch of the channel is again increased, causing the jars while being reinverted to advance at an accelerated speed, the reinverting movement being controlled by stationary guide rails. The speed of the jars is again reduced as they are completing this reinverting movement and may be again increased as the jars approach the discharge end of the conveyor to bring the speed into synchronism with the means for automatically removing them from the conveyor.

Another feature of the invention relates to the variation in the width of the spiral channel at different points along the conveyor. At the intake end of the conveyor the channel is of a

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width to permit the jars to advance while in an upright position, with their axes vertical. As the pitch of the channel is increased, the width of the channel is gradually reduced to such a degree that the angular position of the jars while passing through the high-speed zone is accurately controlled, the jars being held in an inclined position corresponding to the inclination of the spiral channel. In other words, the longitudinal axis of the jar is maintained substantially tangent to its path of movement through the high-speed zone while the top and bottom surfaces of the jar are substantially parallel with the stationary, spiral guiding rods along which said surfaces travel. The width of the channel is in like manner adapted to the angular position of the jars while the latter are being reinverted.

Further features of the invention and its precise nature will appear more fully hereinafter.

Referring to the accompanying drawings:

Fig. 1*a* is a plan view of the major portion of the conveying mechanism including the intake end of the conveyor.

Fig. 1*b* is a like view of the remaining portion of the conveyor mechanism.

Figs. 2, 3 and 4 are cross-sectional views at the vertical planes of the correspondingly designated section lines on Figs. 1*a* and 1*b*, looking in the directions of the arrows. Fig. 2 shows a jar in upright position for receiving the washing water. Fig. 3 shows the jar inverted and being sprayed with rinsing water. Fig. 4 shows the jar reinverted to upright position after the washing and rinsing operations.

Fig. 5 is a fragmentary top plan view showing a jar in an intermediate position during the inverting movement thereof.

Fig. 6 is a view similar to Fig. 5 showing the jar at an intermediate point in the reinverting zone.

The present invention relates to article-conveying and washing mechanism of the type disclosed in the patent to Hohl et al., 2,461,277, Feb. 8, 1949, Article Conveying Mechanism, and embodies various modifications and improvements of the mechanism shown in the patent. The screw conveyor disclosed in the present application may be combined with a mechanism such as shown in said patent for feeding the jars or other articles to the conveyor.

Referring to the accompanying drawings, the screw conveyor 10 is horizontally mounted within a frame 11. The conveyor mechanism may be enclosed or partly enclosed by a sheet metal housing comprising vertical sides 12 and a top or

cover 13 connected to the frame by hinges 14, Fig. 3. The conveyor 10 is rotated continuously about its horizontal axis by power transmitted through a power-driven belt 15 (Fig. 1b) connected through intermediate gearing to the conveyor. The conveyor 10 is substantially in the form of a cylinder, being of uniform diameter throughout the greater portion of its length and formed with a spiral or helical guiding surface 16 in the form of a trough or channel of varying width and pitch as hereinafter described. The articles 17, which are to be transferred from one station to another by the conveyor are shown as open wide-mouth jars and are herein referred to as such, although it will be understood that the apparatus may be used for conveying various other articles.

The jars are fed to the intake end of the conveyor by a belt conveyor 18 (Fig. 1a), and are guided by side belts 19 while being brought under the control of the rotating conveyor. The channel 16, which at the intake end merges into a cylindrical end portion 20 of the conveyor, is of gradually increasing depth throughout an intake zone 16a, and then of uniform depth throughout a zone 16b in which water or other washing fluid is injected into the jars through nozzles 21 (Fig. 2) positioned at intervals along a supply pipe 22. The jars, as they move along through the zone 16b, are supported and guided by means comprising lower and upper guide rails 23 and 24 respectively, which are shown as rods circular in cross-section, and a guide bar or rail 25 which is preferably a flat bar. These guides have a stationary mounting in brackets 26 attached to the frame 11. The guides, 23 to 25, are straight throughout the zone 16b, the guide rail 25 presenting a flat vertical surface in contact with the vertical side wall of the jar and along which the latter rolls as it is advanced by the spiral conveyor. The rails 23 and 24 are spaced a substantially uniform distance apart throughout their length, such spacing being somewhat greater than the length of the jars which are being conveyed. The jars shift lengthwise from the support of one rail to the other during their inverting movements.

Immediately beyond the zone 16b is an accelerating zone 16c in which the pitch of the channel 16 is gradually increased to a high-speed producing pitch which may be maintained uniform throughout a zone 16d herein referred to as a high-speed zone. As the pitch of the channel is increased within the accelerating zone 16c, the width of the channel is gradually reduced to a width at which it gives positive and accurate control of the angular position of the jars 17 as they advance along this portion of the conveyor, the jars being gradually tilted to an inclined position corresponding to the inclination or pitch of the channel. In this connection it will be noted that in order to permit the jars to maintain their upright position while passing through the zone 16b the channel must be substantially wider than in the high-speed zone 16d where the bottle is held parallel with the channel. Beyond the high-speed zone 16d the pitch of the channel is gradually reduced through a reducing or decelerating zone 16e which merges into a second slow-speed zone 16f, the width of the channel being gradually increased along the decelerating zone 16e to permit the jars to again assume upright but inverted position while traversing the slow-speed zone 16f.

The jars 17 are revolved around the axis of the conveyor while in transit through the zones 16c, 16d, and 16e and guided to an inverted, upright position which is maintained as they advance through the zone 16f. The guide rods 23, 24 and guide rail 25 comprise a spiral portion extending along the accelerating, high-speed and decelerating zones for guiding and inverting the jars. These stationary guiding members are shaped and positioned to cooperate with the channel walls of the conveyor in a manner to accurately control the position of the advancing jar at all times.

As shown in Fig. 5 the lower rail 23 is substantially perpendicular to the axis of the jar which at this time rests on the rail 23, the bottom of the jar being parallel with the rail and in contact therewith throughout its diameter. Also the rail 23 is substantially or approximately perpendicular to the adjacent portions of the side walls of the channel and the latter of a width to prevent material side play or tilting movement of the jar within and relative to the channel. The rail 25 throughout the high-speed zone is spaced to hold the jar closely within the spiral channel so that the desired position of the jar relative to the channel is maintained.

With the above construction and arrangement of parts, the jar moves smoothly through the inverting and high-speed zone without binding and with a minimum of friction between the jar and its guiding surfaces, the jar rolling along the surface of the worm and bar 25 as it is inverted. The comparatively high pitch of the channel through the inverting zone permits the jar to be rapidly inverted and with a minimum of frictional resistance, particularly as it reduces the number of rotations of the conveyor shaft needed for carrying the jars forward through the inverting zone wherein there is a gradual curvature of the guides 23—25 through a long range, avoiding a steep angle which would introduce binding and friction.

As the jar is rapidly inverted, the water is thrown out forcibly by the centrifugal force, dislodging any particles of paper, dust or other foreign materials which are within the jar, and which may be adhered to the wall surfaces, thereby effectively cleaning the jar. The inverted jars then pass through the slow-speed zone 16f where they are subjected to a rinsing or spraying operation by rinsing water supplied through a pipe 27 and directed upwardly through nozzles 28 (Fig. 3) into the jars.

After this rinsing operation, the jars are reinverted, bringing them to upright position. The conveyor channel is of increasing pitch through an accelerating zone 16g within which the forward speed of the jars is again accelerated, bringing them to a high-speed zone 16h through which the jars are advanced at a high speed during their rapid reinverting movement. Beyond the high-speed zone 16h the pitch of the channel is again reduced in a decelerating zone 16i. The pitch of the channel may be again gradually increased within a zone 16k for increasing the speed of the jars to that of a transfer wheel 30 which transfers the jars to a filling machine 31 or other receiving means. If the jars are to be filled with material at a high temperature, they may be preheated by using warm water introduced at the zone 16b and then by rinsing water at a still higher temperature within the zone 16f.

Modifications may be resorted to within the spirit and scope of our invention as defined in the appended claims.

We claim:

1. The combination of a screw-type conveyor having a helical channel formed in its surface and extending along the conveyor, said channel including a portion having a relatively low pitch, an accelerating portion forming a continuation of the low-pitch portion and of gradually increasing pitch throughout its length, and a high-pitch portion forming a continuation of said accelerating portion, the width of the channel along the high-pitch portion being less than that along the low-pitch portion, stationary guide rails extending in a straight line along the low-pitch portion of the channel and having curved portions extending spirally along the conveyor within the range of the high-pitch channel portion, said spiral portion of the guide rails being positioned and shaped to guide hollow articles closed at one end as they advance along the high-pitch portion of the channel and revolve them about the axis of the conveyor from an upright to an inverted position, and means for introducing a cleansing liquid into the said articles while in upright position, said liquid being forceably ejected from the said articles during their inverting movement while traveling along the high-speed portion of the guide rails.

2. Apparatus for conveying and washing open-mouth jars, said apparatus including a screw-type conveyor, a stationary frame in which the conveyor is mounted horizontally for rotation about its axis, said conveyor having a spiral channel formed therein and extending lengthwise

thereof, said channel including low-pitch portions and an intermediate high-pitch portion merging into the low-pitch portions, guide rails extending in straight lines along the low-pitch portions of the channel in position to support and hold the jars upright within the low-pitch portions of the channel, said guide rails including spiral portions extending along the high-pitch portion of the conveyor, and shaped and positioned to guide the jars spirally to an inverted position during their passage along the high-pitch portion of the channel, means for supplying a washing fluid and introducing it into the jars as they pass along the first low-pitch portion of the channel and causing such fluid to be forceably ejected from the jars as the latter advance along the high-pitch channel portion, and means for injecting a rinsing fluid into the jars while in their inverted position and advancing along the second low-pitch portion of the channel.

3. The apparatus defined in claim 2, the channel including a second high-pitch portion beyond the second low-pitch portion, the guide rails being extended spirally along said second high-pitch portion of the channel for reinverting the jars.

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