ARTICLE-MANIPULATING APPARATUS FOR PACKAGING MACHINES

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This invention relates to the packaging of articles of merchandise by means of automatic machines in a rapid, continuous manner. The primary objective of the invention has been to provide a mechanism which permits the packaging or wrapping apparatus to be arranged in a straight line for greater convenience in the layout of a wrapping or packaging department than is possible with machines of the type now common.

In the conventional wrapping of an article of manufacture, such as a cake of soap or the like, the paper wrapping is first formed around the article so as to encase two opposed sides and the upper and lower faces, the opposite edges of the wrapper being overlapped upon one another to form a longitudinal seam. At this stage, the wrapper is in the form of a tube having endwise portions projecting beyond the ends of the article of merchandise therein. Next, the endwise-projecting portions of the wrapper are folded, with or without pasting, over the ends of the article of merchandise to complete the closure.

In some conventional wrapping machines, the articles, appropriately conveyed in succession, are placed centrally upon individual wrapping sheets, while in other machines the articles, in succession, are fed to a continuous web of wrapping paper which is progressively formed into a tube around the spaced articles, after which the tube is cut transversely. In either case, the enfolding of the wrapper is accomplished by mechanical paper-manipulating devices which provide the longitudinal encasement and seam while the article is being moved in a given linear direction. The projecting endwise portions of the wrapper are aligned with the direction of movement during these operations.

Next, the articles are advanced, sidewise, through a machine having its conveyor arranged at right angles to the first, so as to present the opposite endwise portions of the partially-wrapped article to plows or manipulators which are effective to complete the folding of the wrapper at the ends. The complete conventional wrapping machine of this general type, therefore, are L-shaped or right-angle one portion of the wrapper envelopment being conducted during the passage of an article along one leg of the machine, and the remaining portion being completed during passage of the article through the other leg of the angle, which is at a right angle to the first.

In a high-speed wrapper, capable, for example, of delivering 100 or more units per minute, the manipulating elements and other components may be disposed over a total machine length of 25 feet. Thus, it is obvious that a machine of such substantial size, which is also L-shaped or angular, does not fit well into the space available in the usual wrapping department, and that space considerations present especial difficulty if more than one wrapping machine of this type is required in a given department. Moreover, in many installations, it is desirable to place the wrapping equipment in assembly-line formation with other machines so that other operations are executed along the line in addition to wrapping, thus complicating the space problem. For example, batches of the wrapped articles may be packed in shipping cartons before they are discharged at the end of the line.

This invention contemplates a wrapping operation which is conducted by individual paper-manipulating and/or gluing and folding elements which are of conventional type and function, but which are arranged in a straight line so as to occupy a minimum of useful factory area.

This invention more specifically contemplates apparatus by which the article of merchandise is encased at its sides and opposed faces within a partially-completed wrapping while in a given linear direction, after which the article and associated wrapper are shifted through a quarter of a revolution, thereby to present the incompletely-formed endwise-projecting portions of the wrapper to folding and manipulating elements which are arranged in the same straight line as the first.

Since the individual wrapping operations are conducted in modern equipment while the merchandise is traveling at a relatively high linear speed, and since the article of merchandise within a partially-completed wrapping, in the form of a tube, may easily be displaced from its required central position therein if subjected to any abrupt motion or change of direction, this invention contemplates an apparatus wherein a partially-wrapped article, while in movement in a given linear direction, is rotated gradually and progressively by 90° through its own plane so that the ends occupy the positions previously occupied by the sides, and so that the sides, now enfolded by a wrapper, may be engaged to effect conveyance of the article past elements for working on the ends.

In a preferred embodiment of this invention, such rotational shifting of each article about its own axis is accompanied by engaging the article within a carrier or channel moved at an appropriate rate of speed, and by utilizing successive cam-like structures to effect partial rotation of the carrier or channel, the total rotational effect thereof accomplish the desired quarter circle shift. In this way, minimum rotational acceleration is imparted to the partially-wrapped article, even though its rate of linear advancement is high, and in this way all abrupt movement is avoided.

It will be understood that the principles of the invention may also be applied to packaging machines which utilize other types of envelopes, and which require the article to be shifted while in transit.

A typical apparatus embodying the principles of the invention is illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of the manipulating apparatus;
Figure 2 is a top plan view of the same;
Figure 3 is a diagrammatic view illustrating progressive stages in the rotational shifting of a partially-wrapped article;
Figure 4 is a fragmentary sectional elevation taken on the line 4—4 of Figure 1;
Figure 5 is a sectional plan view taken on the line 5—5 of Figure 1;
Figure 6 is a view similar to Figure 5, showing the parts after shifting of the article; and
Figure 7 is a sectional view taken on the line 7—7 of Figure 5.

In the apparatus illustrated, partially wrapped articles are rotationally shifted while they are supported and advanced upon a conveyor or belt which is indicated generally at 1. It will be understood, as more fully explained, that the present manipulating apparatus is adapted to be interposed in an intermediate position between conventional wrapping mechanisms, the first of which...
forms a wrapped longitudinally around an article (that is, around the article in the direction of its advancement), and the second of which completes the end folds. It is assumed, therefore, that partially-wrapped articles are delivered to the article comb 2 in a continuous stream, moving in the direction of the arrow at the feed or receiving end, A, of the present apparatus, and that suitable apparatus is arranged to receive the articles discharged from the present apparatus at the end marked 3. The apparatus at the discharge end thus receives the partially-wrapped articles which are not turned through a quarter turn, and completes the end closure while the articles continue to advance in the same linear direction.

The article conveyor 1 is in the form of a continuous bolt 2 carried around rollers 3, 3 which are journaled upon the pedestals 4, 4. The pedestals are shiftably mounted on any suitable base 5, and are adjustable through the usual screws 6 to provide desired tension in the belt 2. One of the rollers is driven by power means (not shown), the rate of speed of the power means preferably being adjustable so that the conveyor speed may be coordinated with the rates of operation of the associated wrapping machines.

The conveyor 1 is surmounted by a continuous conveyor 7, which has one or a succession of article-engaging members or carriers associated with it, as generally indicated at 8. The number of these will depend on the intended rate of production, the spacing and size of the articles passing through the apparatus, and similar factors, as will readily be understood by those skilled in the art.

Conveyor 7 is in the form of an endless chain loop supported at its ends upon sprockets 9. These sprockets respectively are mounted upon an idler shaft 10 and a drive shaft 11. Shafts 10 and 11 are suitably journaled in bearing blocks 12, 12 and 13, 13, respectively. The bearing blocks are mounted by means of bolts 14 upon parallel side plates 15, 15, which are held in spaced relationship by the spacer bars 16. The side plates are supported in elevating position over the table 1 from posts or brackets 16, which project upwardly from the pedestals 4 at one end of the machine. Any suitable mounting of the apparatus over the table 1 may be used in place of that shown.

The conveyor 7 is driven at a rate of speed timed in relation to the rate of feed of the partially-wrapped articles delivered to the belt conveyor 1 at the feed end A. For this purpose, one suitable arrangement is to drive chain conveyor 7 from the powered conveyor 1.

Referring to Figure 4, shaft 11 is provided with a spur gear 17, rigidly fastened thereto. This gear meshes with a planet gear 18, which is rigidly fastened to a drive shaft 19, the latter projecting rigidly from one of the side plates 15, to which it is rigidly fastened by means of a nut 20. A companion sprocket 21 is fastened to the gear 18 by means of screws 22, and this sprocket is engaged by a chain 23 which is driven from a sprocket 24. Sprocket 24 is fastened to shaft 25 of the conveyor 3 by means of a set screw 26.

The article-engaging members 8 are carried from the chain 7 by means of brackets 28 (Figure 7) which, if desirable, may be fashioned as link elements of the chain 7, or which, by welding, may be rigidly fastened to the chain. An article-engaging member 8 is shown in Figure 7 in its active position suspended from the lower run of the conveyor chain 7.

The brackets 28, in the construction shown, are bent outwardly in opposite directions as at 29, 29, to receive a mounting stud 30 which is fastened to the brackets by screws 31, 31, respectively. Mounting block 30 is equipped with a rigidly mounted stud 32; this projects outwardly with respect to the chain, with its axis perpendicular to the surface of the article conveyor along the lower run of the chain. The endwise portion of the stud is counter-turned as at 33, and receives the inner race 34 of an anti-friction bearing. The bearing race is held in place on the stud by means of a snap ring 35. The outer race 36 of the anti-friction bearing is received within an annular ring 37, which is fastened to, or formed as part of, a channel member 38.

The open side of the channel faces the conveyor 1, and the parts are so dimensioned that the open side of the channel is spaced above the surface of the belt conveyor, sufficiently that an article resting on the table may be received within, and engaged by, the side walls of the channel. The upper surface of the channel which is adjacent to the engaged article, may be equipped with a resilient pad 39 appropriately cemented in place.

It will be seen, from the construction just described, that the channel or carrier is rotatable about the axis of the stud 32 on which it is journaled. However, the channel is spring-biased so as normally to reside with its longitudinal axis (that is, the axis through the open ends thereof) aligned with the direction of movement of the chain on which it is carried. The longitudinal axis of the channel also is normally parallel to the longitudinal axis of the conveyor along which the articles are advanced, as the channel advances toward the article as shown in Figure 1.

The channel is biased in this normal position by a con- volute spring 40 (Figure 5). One end of the spring is hooked over a post 41, projecting upwardly from the top surface of the channel 38. The other end of the spring is hooked around a post 42 which projects downwardly from the mounting block 30, while the central portion of the spring surrounds the annular mounting ring 37. The spring, therefore, normally biases the channel or carrier to the position in which it is shown in Figure 5 with respect to shaft 10 and a lineal cam 54, as shown by the arrow, but the carrier may be pivoted against the spring bias, to the position shown in Figure 6. It will be noted that the posts 41 and 42 are engaged against one another in Figure 5, to hold the carrier in its normal position against the spring bias.

As shown in Figures 5-7, each channel or carrier 8 is equipped with cam followers, indicated generally at 44. These are served by stationary lineal cams, indicated generally at 45 (Figures 2 and 3). In the construction shown, there are at least two cam followers and two cams respectively serving the same, but there may be more than two if desired. Each cam is effective to rotate the carrier through a portion only of the intended 90° shift which is to be imparted to it; the total number of cams and respective cam follows, therefore, will depend on the degree of partial rotation which is to be effected by each.

In the preferred construction, each channel is equipped with two cam followers 44, and the cam followers are mounted. This plate is fastened to the front face of the channel 38, as shown in Figure 7, by means of screws 47, the plate 46 being slotted at one end, as at 48, to clear the bearing ring 37. The plate 46 projects sidewise from channel 38, and the cam followers 44 are rotatably mounted upon the outer end of the plate. The cam followers may be in the form of hardened rollers carried by anti-friction bearings mounted upon studs 49, which project upwardly and downwardly from opposite sides of the plate. In the construction shown, one of the followers, 20, is movably linked to the channel plate while the other follower, 51, is mounted at the bottom side.

The lineal cams 45 are positioned respectively to be engaged by the advancing followers. For this purpose, in the apparatus shown, the cams are appropriately fastened to angle brackets 52 which are rigidly fastened to the side plates of the track to the track by screws 53. The angle brackets are offset vertically with respect to one another, in planes related to the followers 50 and 51, thereby selectively serving the vertically offset cam followers. The particular cam, designated 54, is positioned to engage and actuate the lower follower 51, while the other cam, designated 55, is positioned to engage and actuate the other follower 50.

The lineal cams 54 and 55 are arranged in end-to-end-
relationship, substantially coextensive with the run of the conveyor wherein the shifting operation is conducted. This is shown in Figures 2 and 3, the latter illustrating the respective stages of turning movement in the passage of one article-engaging channel 8 through the run. It is to be noted that the carriers 8 of Figure 2 are shown in positions selected to best illustrate the action of a given carrier in advancing across the cams. The actual spacing, as shown in Figure 3, is sufficient to provide clearance for the ends of the wrappers which extend out beyond the ends of the carriers.

The active edge of cam 54 has a substantially flat lead portion, indicated at a. The parts are positioned so that during 51 to 80 along this at the beginning of the run. The lead portion a sweeps gradually into a throw portion b which, action on follower 51, progressively rotates the carrier 8 through the arc, as indicated, counter to the bias of spring 40. Cam 55 resides in slightly-overslipping relationship with respect to the end of cam 54, so that its lead portion c is engaged by the follower 50 as follower 51 rides off the end of cam 54. Progressive movement of the carrier along the run causes the follower 50 to continue the rotation of the carrier in the same direction, the lateral positioning of the cams being related to the positions of the followers so that the transition from cam 54 to cam 55 takes place in substantially smooth, throwwise movement of follower 50. The throw portion c of cam 50 sweeps into a substantially straight trail portion d. This portion holds the channel in its quarter turned position until the article of merchandise is delivered to the end-forming wrapping mechanism, and the carriers 8 depart from the article.

In the preferred construction, as shown best in Figure 3, each cam follower is offset with respect to the direction of travel, so as to trail the axis of stud 32. As indicated in Figure 3, the axis of follower 51 is located on the trailing side of a line e—e, which is drawn substantially normal to the slope of the cam face tracks upon the top surface of the partially-wrapped article as the channel embraces the article at the receiving end A. The said pad is preferably of a thickness to engage the article under slight compression between the pad and conveyor, so as to hold the article against dislodgement during the rotary shift even under high-speed operation. The leading end of the linear cam 54 is located in a position to engage the cam follower after the carrier begins to traverse the chain with the partially-wrapped article embraced within it.

The discharge end B of the conveyor 1 is located inwardly from the end of the chain conveyor, such that the partially-wrapped article, which has been rotated a quarter turn, may be transferred to the second wrapping machine by the carrier which engages it. As shown in dotted lines, the carrier at this end of the machine begins to swing in an arc, upwardly toward the upper run of the chain loop at about the same time the article is transferred from the discharge end B to the second wrapping machine (not shown). It will be noted that the trailing end of cam 55 curves upwardly as indicated at 56, in an axis concentric to the axis of shaft 11. The curved portion maintains the carrier in its transverse position until the follower 50 passes beyond the curved end. At this point, the carrier is released from cam control, and spring 40 functions to return the carrier to its original position wherein post 41 resides in abutment with face 42. In this position, the axis of the channel is in substantially parallelism with the path of travel, to engage and shift another article of merchandise when it reaches the starting point of the run. In very high speed operation, unless a strong spring is utilized, the angular velocity imparted to the carrier may be sufficient to cause it to over-travel. To prevent this undesired effect, the carrier may be equipped with a stop lug 47, engageable with post 42 to limit the throw to only a few degrees beyond 90.

Having described our invention, we claim:

1. Apparatus for manipulating goods during wrapping of the same, an article conveyor having a surface for supporting and advancing the articles, a second conveyor having a run generally in longitudinal alignment with said article conveyor, a plurality of channel-shaped article-engaging members respectively rotatably mounted on said second conveyor, the open ends of said channel-shaped article-engaging members facing said article conveyor and being disposed adjacent thereto throughout the length of said run, a pair of generally linear cams mounted stationarily and together being substantially coextensive with said run, said cams residing generally in parallelism and in planes spaced from one another, and a pair of cam followers carried by said article-engaging members, the said cam followers being positioned respectively in planes related to the planes of said cams for engagement with said cams to gradually and progressively rotate the said individual article-engaging members through an arc of substantially 90° during movement thereof throughout the length of said run.

2. Apparatus for manipulating articles during wrapping of the same, comprising, an article conveyor, a second conveyor having a run generally in longitudinal alignment with said article conveyor, a plurality of channel-shaped article-engaging members respectively rotatably mounted on said second conveyor, the open faces of the said channel-shaped article-engaging means facing said article conveyor and being disposed adjacent thereto throughout the length of said run, a pair of generally linear cams mounted stationarily and together being substantially coextensive with said run, said cams residing generally in parallelism and in planes spaced from one another, and a pair of cam followers carried by said article-engaging members, the said cam followers being positioned respectively in planes related to the planes of said cams for engagement with said cams to gradually and progressively rotate the said individual article-engaging members through an arc of substantially 90° during movement thereof throughout the length of said run.
length of said run, each of said cam followers being offset at the trailing side of a line passing normally from the surface of the cam engageable thereby at the point of engagement of each of said cam followers therewith through the axis of rotation of the article-engaging member served by said cam.

3. Apparatus for manipulating articles during wrapping of the same, comprising, an endless conveyor having a substantially linear run, a plurality of article-engaging members individually pivotally mounted in spaced relation on said conveyor, the said article-engaging members normally having their respective longitudinal axes in substantially alignment with said linear run of the endless conveyor at the start of said linear run, and means for shifting each article-engaging member through an arc of substantially 90° during its movement through said linear run, said means comprising a plurality of cam followers carried by each article-engaging member in spaced relationship to one another, and a plurality of cam members collectively coextensive with said linear run, the said cam members being mounted stationarily and being positioned in spaced relationship corresponding to the spacing of the cam followers to be engaged by respective cam followers of each article-engaging member for effecting successive rotational movements of said article-engaging member through a total arc of 90° during the passage of each article-engaging member through the linear run of the endless conveyor, each cam follower being offset, with respect to direction of conveyor travel, from the trailing side of a line drawn normal to the slope of the surface of the cam member engaged thereby at the point of initial engagement through the axis of rotation of the article-engaging member served by said cam follower.

4. Apparatus for manipulating articles during wrapping of the same, comprising, an endless conveyor having a horizontal run, a plurality of article-engaging channel members individually pivotally mounted in spaced relation on said conveyor, the axes of said channel members being generally aligned with said horizontal run at the start thereof, and means for shifting each channel member through an arc of substantially 90° during its movement through said horizontal run, said means comprising a plurality of cam followers carried by each channel member in spaced relationship to one another in the direction of advancement of the channel members, said cam followers residing in horizontal planes one above the other, and a plurality of cam members collectively coextensive with said horizontal run, the said cam members being mounted stationarily, each cam member being positioned in horizontal planes one above the other related to the planes of the cam followers to be engaged by a respective cam follower of said channel member to cause successive rotational movements of said channel member through a total arc of 90° during the passage of said channel members through the horizontal run of the endless conveyor, and biasing means, including a stop member, for subsequently returning the said channel members to their original positions of alignment with respect to said horizontal run.

5. An apparatus for manipulating articles, comprising, an article conveyor having a horizontal surface for advancing the articles, a second conveyor having a lower run spaced above and parallel with said horizontal surface, a plurality of article-engaging channels, respective bearing members on said lower run journaling said channels for rotary motion about an axis perpendicular to said horizontal surface, each channel having an open face and open ends, biasing means connected to the channel and bearing member of the channel normally to a position with its longitudinal axis aligned with said lower run, a plurality of cam followers on each channel, mounting means projecting from the channel and supporting said cam followers in positions displaced outwardly from the perpendicular axis of rotation of the channel and radially from one another, the cam followers spaced horizontally one above the other, a plurality of stationary linear cam members coextensive with the lower run and corresponding in number to the cam followers, said cam members located in end-to-end relationship and in respective horizontal planes, one above the other, corresponding to the horizontal spacing of the cam followers, the linear cam members having edge portions converging toward the axis of the lower run in the direction of travel of the channels, said edge portions successively engaging the followers of corresponding horizontal spacing and imparting rotary motion of the channels about said perpendicular axis through an arc of 90° during passage of the channel across the lower run.

6. An apparatus for manipulating articles comprising, an article conveyor for supporting and advancing the articles, a forward and rearward rotary member journaled above said article conveyor, a second conveyor tracked upon said rotary members and providing a lower conveyor run spaced above and parallel with the article conveyor, driving means connected to said conveyors advancing said lower run and article conveyor in the same direction, a channel-shaped carrier, a bearing element on the second conveyor journaling said carrier for rotary motion about an axis perpendicular to the article conveyor, said channel-shaped carrier having an open face adjacent the article conveyor and having opposite open ends, spring means connected to said bearing member and to said carrier urging the carrier normally to a position with its longitudinal axis aligned with the direction of advancement of the carrier, a plurality of cam followers on said carrier displaced outwardly from said perpendicular axis, said cam followers spaced in horizontal planes one above the other and radially from one another, a plurality of stationary linear cam extensions along said conveyors, said cam members located in end-to-end relationship and in respective horizontal planes related to the planes of the cam followers for respective engagement thereof with the linear cam members having edge portions converging toward the line of advancement of the carrier, said edge portions successively engaging the advancing cam followers of related planes and imparting rotary motion to the followers and carrier about said perpendicular axis during passage of the carrier across the said lower run, the trailing end of the last of said linear cam, in the direction of carrier advancement, including a curved portion which is substantially concentric to the path of rotation of said rearward rotary member, said curved portion having an edge portion generally parallel to the line of advancement of the carrier and maintaining the carrier in said rotated position as the carrier advances in a curved path upwardly about the rearward rotary member.

7. An apparatus for manipulating articles, comprising, an article conveyor for supporting and advancing the articles, a forward and rearward rotary member journaled above said article conveyor, a second conveyor carried by said rotary members and providing a lower conveyor run spaced above and parallel with said article conveyor, driving means connected to said conveyors for advancing the said lower run and article conveyor in the same direction, an article-engaging channel, a bearing member on said second conveyor journaling the channel for rotary motion about an axis perpendicular to the said article conveyor, said channel having a web and spaced side members projecting toward said horizontal surface during advancement across the lower run, said channel and bearing member normally urging the channel to a position with its longitudinal axis parallel to the lower run, said channel advancing about the forward rotary member downwardly in a curved path converging toward said article conveyor, said spaced side members progressively straddling the sides of an article advancing thereon, the web of said channel including a resilient pad having a curved face concentric to the curved path of advancement around said forward rotary member, said pad tracking upon the surface of the article on the conveyor and confining the article between said article

8. A method of manipulating articles comprising the steps of advancing the article conveyor, the apparatus comprising a plurality of cam followers spaced horizontally one above the other, a plurality of stationary linear cam members coextensive with the lower run and corresponding in number to the cam followers, said cam members located in end-to-end relationship and in respective horizontal planes, one above the other, corresponding to the horizontal spacing of the cam followers, the linear cam members having edge portions converging toward the axis of the lower run in the direction of travel of the channels, said edge portions successively engaging the followers of corresponding horizontal spacing and imparting rotary motion of the channels about said perpendicular axis through an arc of 90° during passage of the channel across the lower run.
conveyor and said face, a cam follower mounted on said channel and located outwardly from the said perpendicular axis of rotation, a stationary linear cam extending along the conveyors, said cam having an edge portion converging toward the line of advancement of the channel, said edge portion engaging the follower and imparting rotary motion to the channel about said axis through an arc of $90^\circ$ during passage of the channel across the said lower run, thereby to rotate the article which is confined therein.

8. An apparatus for manipulating articles, comprising, an article conveyor for supporting and advancing the articles, a forward and rearward rotary member journaled above said article conveyor, a second conveyor carried by said rotary members and providing a lower conveyor run spaced above and parallel with said article conveyor, driving means connected to said conveyors for advancing the said lower run and article conveyor in the same direction, an article-engaging channel, a bearing member on said second conveyor journaled the channel for rotary motion about an axis perpendicular to the said article conveyor, said channel having a web and spaced side members projecting toward said horizontal surface during advancement across the lower run, spring means connected to the channel and bearing member normally urging the channel to a position with its longitudinal axis parallel to the lower run, said channel advancing around the forward rotary member downwardly in a curved path converging toward said article conveyor, said spaced side members progressively straddling the sides of an article advancing thereon, the web of said channel including a resilient pad having a curved face concentric to the curved path of advancement around said forward rotary member, said pad tracking upon the surface of the article on the conveyor and conforming the article between said article conveyor and said face, a cam follower mounted on said channel and located outwardly from the said perpendicular axis of rotation, a stationary linear cam extending along the conveyors, said cam having an edge portion converging toward the line of advancement of the channel, said edge portion engaging the follower and imparting rotary motion to the channel about said axis through an arc of $90^\circ$ during passage of the channel across the said lower run, thereby to rotate the article which is confined therein, the trailing end of the linear cam including a curved portion generally concentric to the path of rotation of the rearward rotary member, said curved portion having an edge portion generally parallel to the line of advancement of the channel and maintaining the channel and article in said rotated position as the channel advances in a curved path upwardly about the rearward rotary member.

9. An apparatus for manipulating particles comprising, an article conveyor for supporting and advancing the particles, a second conveyor having a lower run residing above the article conveyor, driving means connected to said conveyors for advancing the article conveyor and lower run in the same direction, a channel-shaped article carrier, a bearing element on the second conveyor journaled said carrier for rotary motion about an axis perpendicular to the said article conveyor, spring means connected to the bearing element and carrier normally urging the carrier to a position with its longitudinal axis parallel to the direction of conveyor advancement, a pair of generally linear cams extending along said conveyors, said cams displaced laterally from the line of advancement of the carrier, the leading end portion of the first cam, in the direction of carrier advancement, having a cam surface parallel with said line of advancement, said surface leading to a cam surface at the trailing end portion which is inclined generally toward the line of carrier advancement, the linear cams residing in endwise relation and in planes spaced one above the other, the second cam having a cam surface at its leading end which is inclined toward the line of carrier advancement, and a pair of cam followers mounted upon said carrier, the said cam followers being positioned respectively in planes related to the planes of the cams for respective engagement with said cam surfaces, each of said cam followers being located in a position trailing the perpendicular axis of the carrier in the direction of carrier advancement, the cam roller which is related to the first of said linear cams tracking across the parallel cam surface thereof then contacting the inclined cam surface thereof and progressively rotating the carrier through an arc less than $90^\circ$ during linear advancement thereof, the other cam follower engaging the cam surface of the second linear cam as said first follower reaches the end of said first cam, said second cam surface progressively rotating the carrier in the same direction through an arc sufficient to complete $90^\circ$ of carrier rotation as the follower reaches the end of said second cam.

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