

1

3,368,660

ARTICLE GROUPEUR AND FEEDER

Wendell E. Standley, Lake Forest, Richard B. Wittmann, Chicago, and Lawrence S. Tribbey, Northbrook, Ill., assignors to Johns-Nigrelli-Johns, Inc., Skokie, Ill., a corporation of Illinois

Filed Nov. 25, 1966, Ser. No. 597,103

9 Claims. (Cl. 198—34)

ABSTRACT OF THE DISCLOSURE

The mechanism herein disclosed is employed to assure that, in the grouping of open-end can packages in which chimed cans project from the open ends of the packages, any interlocking existing between the chimes of the cans at the trailing end of a group of packages with the chimes of cans within a succeeding package intended as part of a succeeding group, will be broken.

The present invention relates to article grouping mechanism and more particularly to mechanism for grouping articles such as open end can packages in which the cans project partially from the open ends.

In many respects the mechanism of the present invention constitutes a modification and improvement of certain of the basic constructions disclosed in the patents of B. J. Nigrelli et al. No. 3,053,025, No. 3,141,274 and No. 3,194,382, to which reference is made for particular details of construction.

In the process of grouping packages of chimed cans in which the cans are held within open-end cartons, and in which portions of the end cans project from the carton ends, there is a tendency occasionally for the chimes of the exposed cans in one package to hook onto the chimes of cans in an abutting package, resulting in what is termed "chime lock." If a trailing package in one package group becomes attached or connected with a succeeding abutting package due to locked chimes, such trailing package can carry along a succeeding package on its way to a case loading point and cause malfunctioning of the operation by reason of there being more packages in the group than intended.

It is an important object of the present invention to provide grouping mechanism for advancing rows of abutted can packages that tend to develop an occasional chime lock, or for any other types of conveyed articles the adjacent portions of which may tend to become temporarily attached, that will disconnect the attached articles in the operation of advancing the grouped articles toward a loading station or other desired point.

Another object of the invention is to provide an effective method of grouping and feeding articles which is particularly advantageous in the successful grouping and feeding of open-end can packages.

A further object of the invention is to combine with a grouper and feeder device an accelerating mechanism to act upon the articles being grouped and serving to facilitate the separation of the trailing article in the group from a succeeding article which has become temporarily locked thereto.

Additional and more specific objects and advantages of the invention will become apparent as the description proceeds.

In the drawings—

FIGURE 1 is a schematic side elevational view of a machine which includes the grouping and group accelerating mechanism of the present invention;

FIGURE 1a is a schematic, fragmentary, side elevational view of the machine showing the grouping mechanism,

2

but in which the accelerating mechanism, shown in FIGURE 1, is omitted;

FIGURE 2 is a fragmentary, schematic side elevational view, similar to FIGURE 1, but showing the parts of the grouping mechanism in an advanced position, allowing the grouped articles to be moved forward and restraining the line of oncoming articles;

FIGURE 3 is a fragmentary cross-sectional view, on an enlarged scale, taken on line 3—3 of FIGURE 1 looking in the direction of the arrows, showing an article supported on accelerating rolls and lifted above the main conveyor;

FIGURE 4 is a fragmentary cross-sectional view similar to FIGURE 3, taken on line 4—4 of FIGURE 1 looking in the direction of the arrows, showing an article supported on the main conveyor; and

FIGURE 5 is a fragmentary detail view, illustrating the chain lug construction.

The mechanism of the present invention is designed with particular consideration to the effective grouping of articles, such as packages of chimed cans in which the end cans project outwardly at the package open ends and thus contact directly with the exposed cans in adjacent, end-abutted packages. In conveying packages of this type along supply lines preparatory for grouping it sometimes happens in known constructions that the chimes of the projecting cans in one package become overlapped and temporarily locked with cans in an adjoining package, with the consequence that a trailing package in one group to be formed may carry with it a locked package intended for inclusion in the next succeeding group, thus creating a malfunction beyond the grouping station.

The mechanism as herein disclosed provides a main supply conveyor means adapted to advance a line of end-to-end abutted articles to and beyond a grouper. The grouper is controlled to advance at a speed slower than that of the main conveyor and includes a plurality of longitudinally spaced traveling lugs constituting one or more operative pairs of lugs in which the leading lug of a pair is designed to hold or retard an advancing line of articles as such leading lug moves to group-release position. The spacing of adjacent lugs is less than the length of an article group and the trailing lug is controlled to enter the article path at a point where it will rise beneath the rear portion of a trailing article and lift it.

The leading lug of a pair is controlled to move out of the article path after the trailing lug has engaged and lifted the rear end of the trailing article. The group may thus be advanced by the main conveyor, causing the trailing article to slip off the end of the trailing lug and drop onto the main conveyor. The trailing lug, being then in a position ahead of the oncoming line of articles, becomes the leading lug for the next group.

In addition, means are provided for accelerating the advance of the grouped articles at a speed in excess of that of the main conveyor after the group is released from retention by the leading lug.

Referring more particularly to the drawings, a primary or main conveyor, indicated as a whole at 1, is arranged to receive a supply of articles 2, 2 in a long abutted line and advance such articles to and beyond a grouping and feeding station which is indicated as a whole at 3. The article groups are fed from the grouper in spaced relation, allowing for the reception between the groups of push rods, one of which is indicated at 4, carried on overhead conveyor chain 5 which passes over a sprocket 5a on a shaft 5b. The push rod conveyor is designed to propel the article group beyond the end of conveyor 1 and over a dead plate support 6 to the point where the article groups are to be loaded into cases.

It is to be understood that the conveyor 1, and other

parts herein schematically shown, are supported on conventional base frame and auxiliary frame members, and that all shafts are supported on the frame members in suitable bearings.

The conveyor 1, as herein shown, comprises endless members 7, 7 which may be in the form of belts or sprocket chains and for convenience, are referred to herein as belts. As shown in FIGURES 3 and 4, the belts 7, 7 are supported within guides or grooves on the upper edges of bars 8, 8, supported on transverse frame members one of which is indicated at 9. The bars 8, 8 or similar support elements may extend throughout the length of conveyor 1. The belts 7, 7 are spaced laterally so as to support the articles 2 near their lateral edges. Only a single pair of belts is indicated, arranged to support a single row of articles. In practice, however, there may be two or more belts arranged to support two or more articles disposed in side-by-side relation. The mechanism thus may be modified to enable it to form groups of any desired or convenient number of articles disposed laterally and lengthwise.

The grouping station is preferably arranged in relatively close relation to the receiving end of the push rod conveyor so that push rods 4 on the chains 5, operating in timed relation to the main conveyor and the grouper, may enter within the spaces between adjacent groups in readiness to propel them over plate 6 to the loading station. Driving means for the push rod conveyor and the main conveyor may be identical to that disclosed in Patent No. 3,053,025 or Patent No. 3,194,382.

The grouper mechanism may comprise an endless member such as a sprocket chain 10 disposed between the belts 7, 7. The upper run of chain 10 is suitably guided upon a rail 11 supported by transverse frame members 9. A suitable number of lugs 12, 12, herein shown as three lugs, are secured in spaced relation on the chain.

The lug chain is arranged to pass around suitable rotary elements or sprockets, indicated at 13, 14 and 15, mounted respectively on shafts 16, 17 and 18. Sprockets 14 and 15 are preferably at the same level below the belts 7 and sprocket 13 is arranged at a lower level, whereby the lugs will move in an upwardly inclined path between sprocket 13 and sprocket 14.

The lugs 12 may conveniently be secured upon outwardly bent lugs or bracket elements 10b formed as parts of the link plates 10a of the chain 10. See FIGURES 4 and 5. As shown in FIGURE 4, the outer ends of the link pins 12a, passing through the link plates that support the lugs 12, are received in guide channels 8a formed in the bars 8 and serve to hold the lugs 12 against displacement as they travel with chain 10 along its upper run.

The lugs 12 are spaced apart a distance somewhat less than the length of the article group and the sprockets 14 and 15 are preferably spaced so that, when a leading lug approaches a point where it is ready to move down around sprocket 15 and out of contact with the leading face of the article group, the trailing lug will be on the inclined portion of the chain between sprockets 13 and 14. The outer free end of this trailing lug will thus engage the lower face of the trailing article and begin lifting at least the rear portion of the article from the normal article path. See FIGURES 1 and 1a. Lifting of the rear portion of the trailing article thus tends to disconnect such article from the one which follows in the event they should be temporarily attached. Separation of the articles tends to be assured after the leading lug moves down around sprocket 15 to leave the article group under the control of the main conveyor, as will presently be made clear.

The sprocket chain 10 is preferably driven at a somewhat slower speed than that at which the belts 7, 7 are driven, whereby, when the leading article in the supply row is in contact with a lug, the advance of the articles behind the lug will be retarded and the belts will slip

forwardly below the articles. For the purpose of driving the chain 10 of the grouper unit, suitable transmission mechanism (not shown) is provided between the shaft 5b of the push rod conveyor and the shaft 18 carry the lug chain sprocket 15. In the present instance the grouper unit is described as intermittently operated and suitable driving means for this purpose is disclosed in detail in Patent No. 3,194,382. In the event it is desired to operate the grouper unit continuously, driving means may be employed as disclosed in Patent No. 3,053,025.

The grouping and feeding mechanism is preferably operated to be started and stopped periodically in time with the movement of the push rods 4 on the overhead push rod conveyor chains 5. For this purpose the driven shaft 18 is intermittently controlled by conventional clutch and brake mechanism, not herein shown. A suitable arrangement of single-revolution clutch and brake mechanism and control devices therefor is disclosed in Patent No. 3,194,382 above referred to. In each type of driving mechanism, controls are employed to assure that the grouper unit will remain in synchronism with the push rod conveyor even though the operation of the grouper unit is temporarily suspended while the push rod conveyor continues in motion.

The mechanism of the present invention preferably includes means for accelerating the advance of the articles at the grouping station. For this purpose the sprocket chain 10 supports a number of freely rotatable rolls 21, 21 carried on extended chain link pins, as shown at 21a in FIGURE 3. As herein shown, each roll 21 preferably has hub extensions 22 of reduced diameter arranged to have rolling contact with track bars 23, 23, preferably fixed to the transverse frame members 9 alongside the bars 8, 8. As the sprocket chain 10 advances around its sprockets the hub extensions 22 on rolls 21 will be brought to bear upon the track bars 23 so that the rolls 21 will be caused to rotate.

The diameter of the rolls 21, as best shown in FIGURE 3, is of sufficient size so that their upper peripheral surfaces will extend somewhat above the supporting surfaces of the conveyor belts 7, 7. Thus, articles advancing along the belts will be moved onto the rolls 21 as such rolls are bodily advanced to the grouping station. As soon as the hub extensions 22 reach the track bars and begin to roll on such bars, the rolls 21 will be caused to rotate at a surface speed in excess of that of the lineal speed of the belts 7.

As herein shown, the spaces between adjacent lugs are preferably substantially filled with rolls 21 so that such rolls may support the entire article group.

In the normal operation of the grouper mechanism illustrated in FIGURE 1 the articles to be segregated will be held or retarded by the lug 12 that is ready to move down around the sprocket 15, and the oncoming line of articles will be urged against the trailing article of the group, due to the fact that the conveyor belts operate continuously. When the leading lug 12 moves out of holding relation with the leading article, the group is free to advance unimpeded on the belts 7.

At the time the leading lug moves out of holding position the accelerating rolls are supporting the article group to be released. With the chain 10 advancing and moving the rolls bodily forward, the hubs 22, 22, bearing on the track bars 23, 23, cause the rolls to rotate at a peripheral speed greater than the lineal speed of the belts. This results in a relatively abrupt forward movement of the article group and such movement will continue for a brief interval until after the leading article moves clear of the rolls 21 and the frictional contact between the articles and the belts 7, 7 becomes greater than that between the articles and the rolls. The spacing of the article group ahead of the supply line will then appear approximately as illustrated in FIGURE 2.

The principle of the operation is that, when the rolls are ready to advance, the entire article group is under

the control of the accelerating rolls. The action of the rolls on the articles tends to advance the leading section of the group in a sliding manner on the main conveyor and this continues until an increased proportion of the group is resting on the conveyor at which time the rolls will begin to slip beneath the group and then cease to propel it with respect to the main conveyor. The action may be varied as the relative frictional properties between the various parts are changed.

If desired, the rolls 21 may be coated with any of the various well known compositions to increase the friction between the rolls and the articles to be grouped. The hubs 22 of the rolls and the contacting surface of the track bars 23 may be suitably treated to obtain a desirable degree of friction between them. Also, if desired, a positive action between the hubs and track bars may be obtained by substituting racks for the track bars and pinions for the hubs 22.

Continued advance of the segregated article group on the belts 7, 7 will increase the spacing between such group and the leading article in the supply line which moves forward under control of the lug 12. The spacing between the released group and the leading article in the supply line will be such that a push rod 4 may readily enter the space preparatory to acting to propel the group in its further travel.

It is to be understood that, when the present mechanism is to be operated without the inclusion of the accelerating rolls, such as illustrated in FIGURE 1a, the article group will be supported throughout its entire length upon the main conveyor belts 7 as soon as the trailing article moves off the end of the trailing lug. This lug, which becomes the leading lug for the next group, then is in position to control the oncoming supply line, causing it to move more slowly than the main conveyor. This action creates the desired space at the rear of the segregated group to allow for the entry of the push rod 4.

From the foregoing it is apparent that there is provided an effective method, as well as mechanism, for grouping and feeding end-to-end abutted articles of uniform size which are so formed or constructed that there is a possibility that the adjacent ends of some of the articles will become temporarily attached or connected. The herein disclosed method is particularly useful in connection with the grouping and feeding of open-end packages of chimed cans which project outwardly at the package ends, allowing cans in adjacent packages to come into contact with each other and resulting occasionally in the condition of chime lock. The method comprises the provision of a conveying means on which an end-to-end abutted line of articles, such as rectangular can packages, may be advanced along a fixed path in a yielding manner, whereby the conveying means urges the line forward and may slip beneath the line when the article movement is either retarded or stopped. The advancing line of articles is retarded by the leading lug of a pair of spaced, grouping lugs having a spacing less than the length of the article group to be formed. The spaced grouping lugs are guided to travel in a path in which their free end portions will move from a point below the article path, and at a small angle thereto, to a position within the article path—more specifically, to a position above the path of the bottom surfaces of the articles. The path of the lugs then extends forwardly, generally parallel to the article path, then downwardly and out of the article path.

As the leading lug advances along the article path it restrains or retards the advance of the line of abutted articles, and the trailing lug, moving up and across the normal article path, lifts the rear end of the trailing article, tending thus to disconnect or detach it from the succeeding, abutted article. Then, as the leading lug moves downward out of the article path, the article group is no longer restrained and moves forward at a faster speed than the trailing lug. This causes the trailing article to slip off the free upper end of the trailing lug and the leading article in the advancing supply line moves for-

ward with such line and engages behind the trailing lug which then retards the forward movement of the article line and causes a space to be created between the released article group and the leading article in the line.

An added advantage is obtained by the additional method step of accelerating the forward movement of the article group for a brief interval at a speed faster than the normal speed of the articles on the conveying means, such acceleration being effective immediately following the movement of the leading lug down and out of the article path.

While the present description sets forth a preferred embodiment of the invention, numerous changes may be made in the mechanism as disclosed without departing from the spirit of the invention, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description of indicate the scope of the invention.

We claim:

1. In a mechanism for forming segregated groups of upstanding, uniform size articles from a conveyed row of abutted articles, the combination of

an elongated main conveyor on which a supply line of abutted articles may be advanced, such conveyor extending along a generally planar path and including means to support the articles along two laterally spaced lines,

means for constantly operating the main conveyor to advance the articles,

a traveling grouper member arranged lengthwise of the main conveyor and having longitudinally spaced lugs separated at a distance somewhat less than the length of an article group,

means for operating said traveling member to advance at a speed less than the speed of the main conveyor,

means for guiding said lugs whereby their free ends will move successively in a path offset laterally from the lines of support of the main conveyor and extending from a position below the article path on the main conveyor to a position within the article path, then longitudinally along such conveyor and then to a position below the article path, the leading lug of a selected pair of adjacent lugs being adapted to be contacted by the leading surface of a group of advancing articles to retard the advance of the articles on the main conveyor due to the slower speed of the traveling member, the free end of the trailing lug of the selected pair of adjacent lugs on the traveling member being adapted to move in its path from a position below the main conveyor into a position to engage the underside of the trailing article of the group and lift at least the trailing end portion of such article, thereby tending to disengage it from a following article, and whereby, when the advancing movement of the leading lug brings it down below the path of the articles on the main conveyor and no longer acting to retard the advance of the leading article of the group to be formed, the greater speed of the main conveyor will advance the group faster than the speed of the lugs, causing the trailing article of the group to slip forwardly off the free end of the trailing lug which then acts to retard the advancing article supply line on the main conveyor.

2. A mechanism as defined in claim 1 in which means are provided for stopping the traveling grouper member when the leading lug of a selected pair of lugs reaches a position a short distance behind the point in its path where it will move below the article path.

3. A mechanism as defined in claim 1, wherein there is provided article accelerating means associated with the traveling member to advance the articles at a speed in excess of the speed of travel of the main conveyor, such means acting in the space between adjacent lugs.

4. A mechanism as defined in claim 1, wherein the traveling grouper member, supporting the lugs, is in the form of an endless chain.

5. A mechanism as defined in claim 1, in which a series of article-supporting rolls is carried by said traveling grouper member in advance of the trailing lug of a selected pair of lugs, the peripheries of said article supporting rolls being disposed slightly above the plane of the main conveyor, whereby articles advancing on the main conveyor ahead of the movement of the trailing lug into the article path will readily move onto the peripheries of such rolls, the longitudinal extent of the series of rolls being sufficient to support more than one-half the length of the article group out of contact with the main conveyor, and means for rotating the rolls at a peripheral speed in excess of the speed of the main conveyor as the grouper member advances, whereby, upon movement of the leading lug out of the path of the article group, such group will be caused to advance faster than the travel of the main conveyor for a limited distance.

6. A mechanism as defined in claim 5, in which the means for rotating the article-supporting rolls comprises a reduced-diameter hub element on at least some of the rolls, and a stationary track bar disposed adjacent the article grouping station in a position so that the hubs of the rolls will bear upon said track bar and cause rotation of the rolls as they advance bodily with the traveling member, the relative size of the hubs and of the rolls being such that the rolls will be rotated at a peripheral speed in excess of the speed of travel of the main conveyor.

7. In a mechanism for forming segregated groups of upstanding, uniform size articles from a conveyed row of abutted articles, the combination of

an elongated main conveyor comprising two laterally spaced, article-supporting and conveying members extending along a generally planar path,

means for driving the main conveyor to advance a row of abutted articles thereon,

an endless grouping member arranged longitudinally of the main conveyor and carrying a series of projecting lugs thereon,

means for driving said endless member at a speed less than the speed of the main conveyor, whereby a conveyed article, bearing against the rear face of a lug, will be retarded in its advancing movement,

the path of the free end portions of the lugs being from a location below the main conveyor upwardly at a small angle to a location above the main conveyor and into the path of articles thereon, thence along and generally parallel to the main conveyor, and thence downward to a location below the main conveyor and out of the path of articles thereon, the spacing of adjacent lugs on the endless member being less than the length of the group of articles to be segregated, whereby, when the advancing row of abutted articles moves forwardly on the main conveyor with the leading article bearing against and retarded by the leading lug of a selected pair of adjacent lugs, the trailing lug of the pair will move up beneath the trailing article near its rear end and lift the rear end portion of the article, and whereby, when the advancing movement of the leading lug of such adjacent pair of lugs brings it down below the path of the articles on the main conveyor and no longer acting to retard the advancing movement of the leading article of the group to be formed, the greater speed of the main conveyor will advance the group faster than the speed of the lugs on the endless member, causing the trailing article of the group to slip forwardly off the free end of the trailing lug and such lug thereafter acts as the leading lug for the next group to be segregated and may receive contact by the next oncoming article of the abutted row to retard the forward movement of such row.

8. A mechanism as defined in claim 7 in which the endless grouper member is controlled so as to stop periodically a short distance behind the point at which the leading lug will pass down out of engaging relation with the leading face of the article group.

9. A mechanism as defined in claim 7 wherein there is provided article accelerating means associated with the endless grouping member to advance the articles at a speed in excess of the speed of the main conveyor, such means acting in the space between the lugs.

References Cited

UNITED STATES PATENTS

3,143,202	8/1964	Rowlands	198—34
3,194,382	7/1965	Nigrelli	198—34

RICHARD E. AEGERTER, *Primary Examiner*.