

June 16, 1942.

A. F. WHITEHEAD
CONVEYER AND DRIVING MECHANISM THEREFOR

2,286,523

Filed June 14, 1940

2 Sheets-Sheet 1

Fig. 1

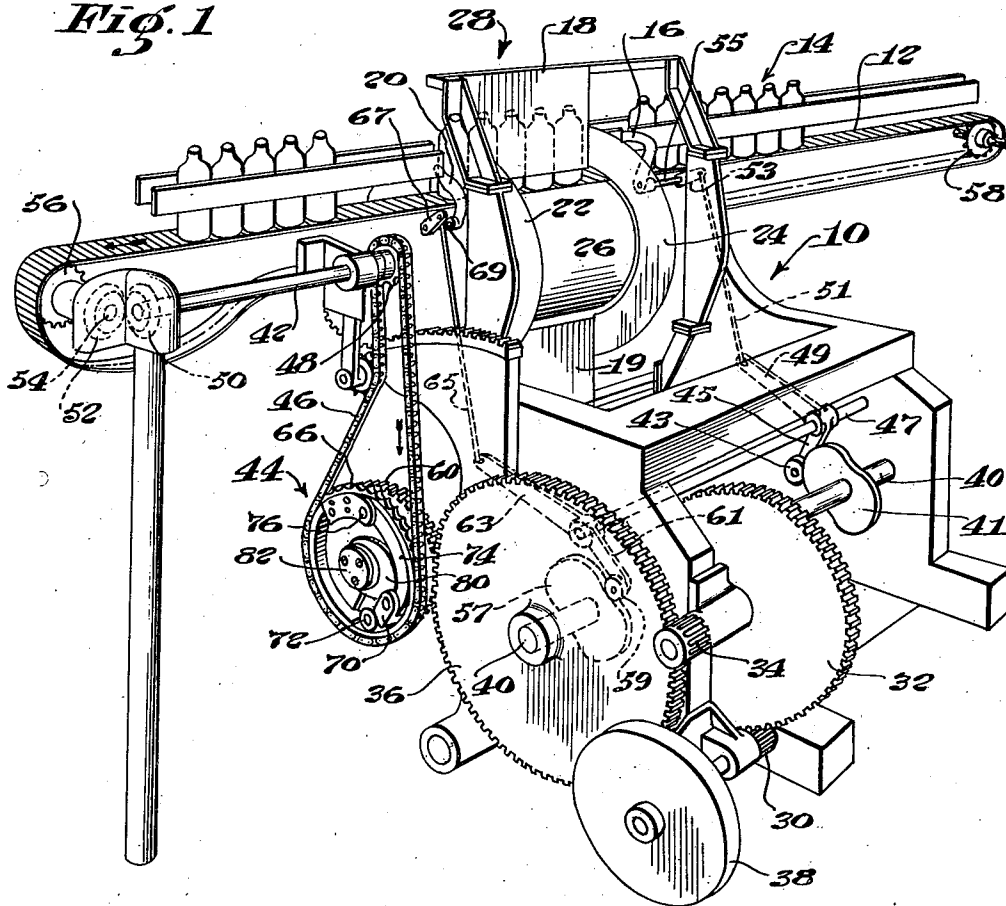


Fig. 3

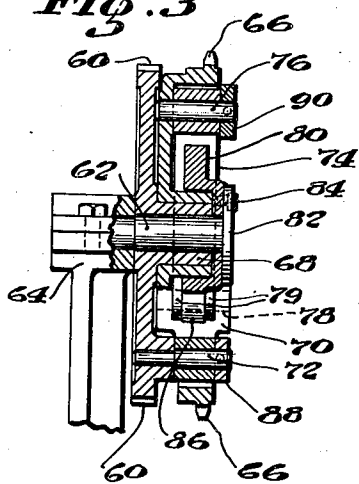
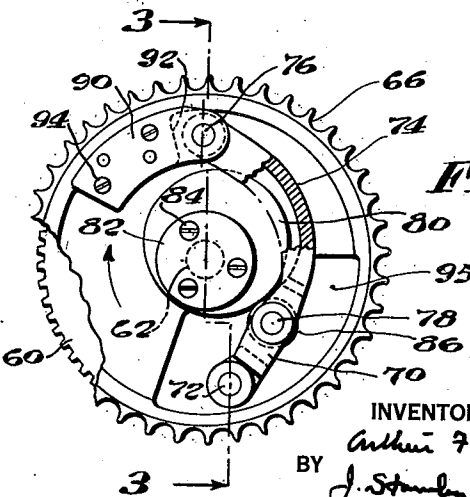


Fig. 2



INVENTOR
Arthur F. Whitehead
BY
J. Stanley Churchill
ATTORNEY

June 16, 1942.

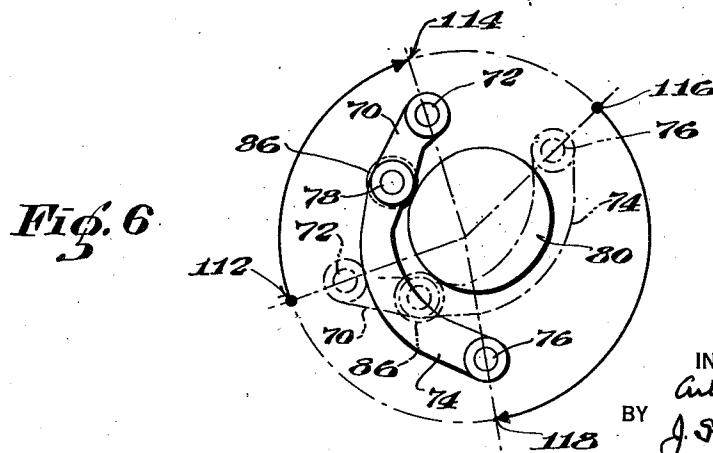
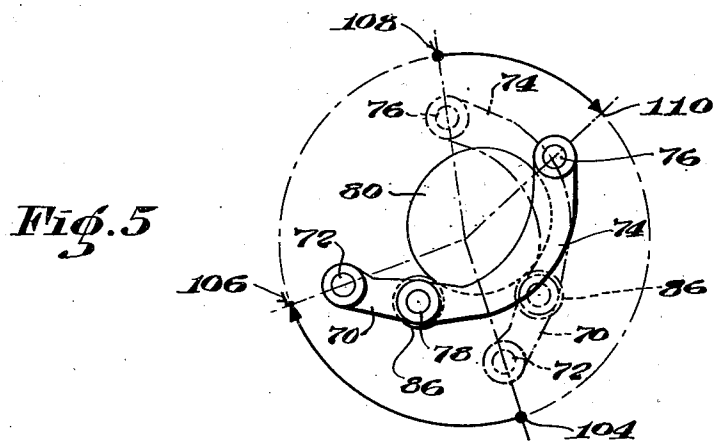
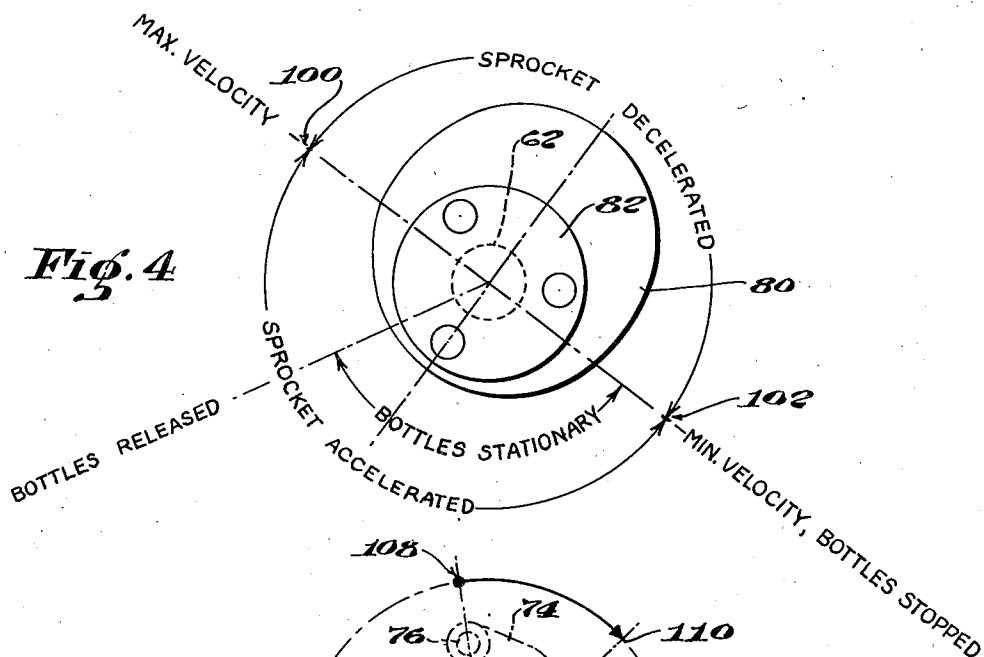
A. F. WHITEHEAD

2,286,523

CONVEYER AND DRIVING MECHANISM THEREFOR

Filed June 14, 1940

2 Sheets-Sheet 2



INVENTOR
Arthur F. Whitehead
BY J. Stanley Churchill
ATTORNEY

UNITED STATES PATENT OFFICE

2,286,523

CONVEYER AND DRIVING MECHANISM
THEREFORArthur F. Whitehead, Wollaston, Mass., assignor
to Pneumatic Scale Corporation, Limited,
Quincy, Mass., a corporation of Massachusetts

Application June 14, 1940, Serial No. 340,515

8 Claims. (Cl. 198—34)

This invention relates to a conveyer and to a driving mechanism therefor.

The invention has for an object to provide a novel and improved conveyer for handling articles such as containers which are required to be brought to rest thereon while the conveying element continues in operation, in which provision is made for driving the conveying element in a manner such as to enable the articles to be brought to rest in a gentle manner to reduce to a minimum the impact between the articles, or between the articles and the usual stop member.

Another object of the invention is to provide a novel and improved driving mechanism for a conveyer of the character specified by which the conveying element is alternately increased and decreased in speed at predetermined intervals in each cycle of operation, whereby articles carried by said conveying element may be brought to rest gently and smoothly by a stop member disposed in the path of the articles along the conveyer at a point corresponding to the period of minimum velocity of the conveyer, thereby reducing to a minimum the impact between the containers and the stop member when the containers are brought to rest.

Another object of the invention is to provide a novel and improved container handling machine in which the containers are required to be brought to rest upon a continuously moving conveyer and in which provision is made for decreasing the lineal velocity of the conveyer member at predetermined intervals in the cycle of operation corresponding to the period at which it is desired to stop the containers, whereby to reduce to a minimum the impact of the containers with the stopping means, or between the containers.

With these general objects in view and such others as may hereinafter appear, the invention consists in the conveyer, in the driving mechanism therefor, and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a perspective view of a conveyer embodying the present invention and which is herein shown for purposes of illustration as a conveyer for a bottle cleaning machine; Fig. 2 is a detail view in front elevation of the driving mechanism for the present conveyer; Fig. 3 is a detail view in cross-section on the line 3—3 of Fig. 2; Fig. 4 is a detail view of an eccentric cam to be referred to;

and Figs. 5 and 6 are diagrammatic views illustrating the relative movement between the driven and driving portions of the driving mechanism, as will be described.

For purposes of illustration, the present invention is preferably shown as embodied in a bottle cleaning machine, in which the containers, such as bottles, to be cleaned are carried in a line into the machine on a conveyer provided with stop members arranged to separate the line of bottles into groups and to hold a group of bottles in place to be transferred to cleaning position. Prior to the present invention, the conveyer was driven continuously at a constant rate of speed so that when the bottles came up against the stop member, the sudden jar would cause a great deal of noise and the impact would at times result in breakage of the bottles.

In accordance with the present invention, the continuously driven conveyer is arranged to be driven at a variable velocity, the rate of speed of the conveyer belt being alternately increased and decreased at predetermined intervals in the operation of the machine, and the stop members are arranged to be operated in timed relation to such conveyer movement in a manner such that a group of containers is stopped during the period of minimum velocity of the conveyer belt, while the latter continues its movement sliding along under the containers. Thus, the bottles may be brought to rest gently and smoothly against the stop members without sacrificing any speed of output or production of the machine since an increased speed of the conveyer belt between stops may compensate for the time used in bringing the containers down to a reduced velocity when they are to be stopped.

Referring now to the drawings, as above indicated, the invention has been illustrated as embodied in a machine for handling bottles and particularly in a bottle cleaning machine indicated generally at 10 having a conveyer 12 upon which a supply of the bottles 14 or other containers to be cleaned are placed to be fed into the machine. In the operation of the machine, the line of bottles is permitted to advance on the continuously moving conveyer 12 up against a stop 16 which is arranged to engage and subsequently to release the line of bottles to be cleaned in timed relation to the cleaning mechanism. The released bottles are arranged to be advanced into a pocket 18 and in order to separate the line of bottles into groups corresponding to the number of bottles to be cleaned

during each cycle of operation of the machine, the stop member 16 is actuated to be interposed between adjacent bottles separating the group to hold back the main line of bottles. The group of bottles thus released into the pocket 18 are brought to rest against a second stop member 20 which holds the bottles in alignment with rotary guide rails 22, 24 supported upon a stationary drum 26.

Only a sufficient portion of the cleaning mechanism, indicated generally at 28, has been herein illustrated and described as will enable the present invention to be understood. In general, such cleaning mechanism includes two pockets 18, 19 spaced 180 degrees apart which are arranged to be rotated about the drum 26 to present the bottles to be cleaned in an inverted position in alignment with a plurality of air nozzles, not shown, which are adapted to be extended into the bottles to pneumatically clean the same. Simultaneously with the inverting of one set of bottles, the second pocket 19 is brought up into a vertical position to return a previously cleaned set of bottles to the conveyor 12. The stop member 20 is then operated to release the cleaned set of bottles onto the outgoing portion of the conveyor 12 to be delivered from the machine, and the stop 16 is again actuated to permit a new set of containers to enter the pocket, as above described.

In accordance with the present invention, provision is made for driving the conveyor belt 12 in a manner such as to permit the containers to come to rest gently against the stop members 16, 20 during the continuous operation of the conveyor. As herein shown, the conveyor 12 is driven in timed relation to the operation of the stop members 16, 20 and the cleaning mechanism 28 through connections from the main drive of the bottle cleaning machine which, as herein illustrated, comprises a gear train including the pinions and gears 30, 32 and 34, 36 and the gear train may be driven by a pulley 38 connected to any usual or preferred form of driving means, such as an electric motor, not shown.

The large gear 36 is fast upon a cam shaft 40 supported in the machine frame, and as herein shown, is connected to an intermediate shaft 42 through the variable velocity driving mechanism indicated generally at 44 by a chain 45 and sprocket 43. The intermediate shaft 42 is provided with a bevel gear 50 which meshes with a corresponding bevel gear 52 fast on the conveyor shaft 54 upon which the driving sprocket 56 for the link belt 12 is mounted. The belt 12 is arranged to pass over an idler sprocket 58 at the other end of the conveyor.

As illustrated in Fig. 1, the stop members 16, 20 are arranged to be actuated in timed relation to the operation of the conveyor 12 through connections from the cam shaft 40. The stop member 16 is arranged to be rocked into and out of the path of the line of bottles 14 by a cam 41 fast on the cam shaft 40, and through a cooperating roller 43 carried by one arm 45 of a bell crank rockingly mounted on a cross shaft 47. The other arm 49 of the bell crank is connected by a link 51 to a lever 53 fast on a rod 55, suitably mounted in the machine frame, and to which the stop member 16 is secured. The stop member 20 is similarly actuated by a cam 57 cooperating with a roller 59 carried by a lever 61 pivotally mounted on the cross shaft 47. The other end 63 of the lever 61 is connected by a link 65 to a lever 67 fast on a rod 69 to which

the stop member is attached. In practice, the stop members may be adjusted to operate simultaneously so that in operation, after both stops have been withdrawn, by the time the last or, as herein shown, the fifth bottle of the group in the pocket has passed the stop 20, five bottles of the line 14 have also passed the stop 16 whereupon both stops 16, 20 are rocked forwardly, the stop 16 being interposed between the fifth and sixth bottles of the line to form a group, and the stop 20 being rocked into the path of the oncoming group to position the group in the pocket, as above described.

Referring now to Figs. 2 and 3, the variable velocity driving mechanism 44 comprises a gear 60 freely mounted upon a stud 62 secured in a bracket 64 mounted upon the machine frame. The gear 60 is arranged to be driven at a constant or uniform rate of speed through engagement with the large gear 36. A sprocket 63 is loosely mounted upon the hub 63 of the gear 60. The gear 60 is connected to the sprocket 63 by linkage including a link 70 pivotally connected to a stud 72 fast in the gear 60, and a link 74 connected to a pin 76 mounted on the sprocket 63. The other ends of links 70, 74 are provided with forked ends pivotally connected together by a pin 78 thus providing a flexible connection between the gear and the sprocket adapted to be shortened and lengthened as the links are rocked on the pivot pin 78.

Provision is made for automatically varying the length of the link connection between the gear 60 and sprocket 63 during the rotation thereof in a manner such as to drive the sprocket 63 at a variable angular velocity, alternately producing an accelerated motion and a decelerated or retarded motion, while the gear 60 is driven at a uniform rate of speed. As illustrated in Figs 2 and 3, this change is produced by a fixed cam or eccentric 80 which is secured to a headed portion 82 of the stud 62 by screws 84. The cam 80 is arranged to cooperate with a roller 86 carried on the pivot pin 78 between the forks 79 of the link 74 as shown in Fig. 3. With this arrangement, as the gear 60 is rotated at a uniform rate of speed, the angular distance between the pivotal points 72, 76 of the gear and the sprocket respectively is changed by the cooperation of the stationary cam 80 and the roller 86 to vary the angular speed of the sprocket 63. The sprocket 63 is connected by the chain 46 to the sprocket 48 and through the connections above described the conveyor belt 12 is alternately driven at an increased and a decreased rate of speed. As shown in Fig. 3, the link 70 is retained on its stud 72 by a collar 88. The other link 74 is retained on the pin 76 by a retaining member 90 secured to a raised portion 92 of the sprocket by screws 94. The gear and sprocket assembly are held from lateral movement on the stud 62 between the bracket 64 and the inner face of the cam 80 as illustrated in Fig. 3. As indicated in Figs. 2 and 3, an opening 95 is provided in the sprocket 63 to provide clearance for the link 70 and stud 72 during the relative movement between the gear and sprocket.

In the operation of the device, the bottle stop members 16, 20 are arranged to be actuated in timed relation to the movement of the conveyor so as to bring the bottles to rest at the period of minimum velocity of the conveyor, and as indicated diagrammatically in Fig. 4, the cam 80 is designed to decelerate the driving sprocket 63

from a point of maximum angular velocity, as indicated at 100, to a point of minimum angular velocity, as indicated at 102, during one half a revolution or 180 degrees of the cycle of operation, and that during the remaining 180 degrees of the cycle the cam is designed to accelerate the driving sprocket from the point of minimum angular velocity to the point of maximum angular velocity to complete one cycle of operation. As indicated in Fig. 4, the bottles are arranged to be stopped at the point of minimum velocity of the conveyer and remain stopped for an interval of approximately 130 degrees in the cycle during the time when the conveyer is being accelerated and at which time the pockets 18, 19 are being rotated to bring a cleaned set of bottles upright on the conveyer and to present a set of bottles in inverted position to be cleaned, whereupon, the cleaned bottles are released and a new set of bottles is permitted to enter the pocket to begin a new cycle of operation, as above described. It will be apparent that the cleaning operation which is performed while the bottles are in their inverted position may occur at any time during the bottle moving period in the cycle of operation of the machine.

Referring now to Figs. 5 and 6, the relative movement or angular velocity of the gear 60 and sprocket 66, as controlled by the cooperation of the linkage 70, 74 and the cam 80 is therein diagrammatically indicated. It will be observed in Fig. 5 that in the relative positions shown, when the gear 60 and stud 72 has moved through approximately 90 degrees at a uniform rate of speed from the point 104, as indicated in the dotted line position, to a point 106, as indicated in the full line position, the gradual extension of the linkage 70, 74 as determined by the cam 80 and roller 86 causes the sprocket 66 to be moved through an angle of approximately 55 degrees during the same time to produce a decelerated or retarded angular velocity of the driving sprocket 66, as indicated by the distance between corresponding points 108, 110. Similarly, as shown in Fig. 6, in the relative positions of the linkage therein shown, it will be observed that when the gear 60 is moved through approximately one quarter of a turn from the dotted to the full line positions of the linkage as indicated by the distance between corresponding points 112, 114, the gradual contraction of the linkage 70, 74 as caused by the cooperation of the cam 80 and roller 86, the sprocket 66 will be moved a substantially greater distance as indicated between points 116 and 118 in the same period of time to produce an accelerated angular velocity of the sprocket.

From the description thus far it will be observed that the changes in angular velocity of the sprocket 66 produce corresponding changes in the linear velocity or surface speed of the conveyer belt 12 through the driving connections above described. In practice, the relation of the driving connections is such as to cause the belt 12 to be driven at its minimum velocity just as a container on the conveyer reaches a position in front of the stop members 16 or 20, so that, in effect, the lineal distance from one stop to the next represents the period in the cycle of the driving mechanism 44 between the bottle releasing position and the stopping position as indicated in Fig. 4. It will be apparent that this relationship is maintained throughout the entire travel of the bottles along the conveyer so that the bottles are alternately accelerated and re-

tarded in speed at predetermined intervals in the operation of the machine. It will also be observed that the stop members 16, 20 may be actuated through the cams 41, 57 and connections described, to stop the bottles at a time such as to coincide with a period of minimum velocity of the conveyer belt whereby to bring the bottles to rest as gently and smoothly as possible without retarding the production capacity of the machine.

Although the invention has been herein illustrated and described as embodied in a bottle cleaning machine, it will be apparent that the invention may be embodied in other machines such as bottle filling or labeling machines or other types of machines where it is advantageous or desirous to vary the speed of the containers or other articles being conveyed at predetermined intervals.

It will also be apparent that the rotary mechanism for producing variable angular velocity may be used for purposes other than those herein illustrated and described.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. In a conveyer of the character described, in combination, a continuously moving belt upon which articles are transported, a movable stop member adapted to be projected into the path of said articles to bring them to rest on the conveyer while the belt continues to move, means for operating said stop member, and positively operating means for reducing the linear speed of said belt at predetermined intervals coinciding with the operation of said stop member whereby to reduce to a minimum the impact between an article and the stop member.

2. In a conveyer of the character described, in combination, a continuously moving belt upon which containers are transported in a line, movable means engageable with said containers for stopping and releasing them upon the conveyer at predetermined intervals while the belt continues to move, means for operating said container engaging means, and positively operating means for driving said belt arranged to increase and decrease the linear velocity thereof at predetermined intervals, said stopping and releasing means being actuated in timed relation to said belt speed in a manner such as to bring the containers to rest at the period of minimum velocity of said belt.

3. The combination with a conveyer having provision for conveying containers in groups, of movable stop members adapted to be operated to bring successive groups of containers to rest on the conveyer while the latter continues in operation, means for operating said stop members, and positively operating driving mechanism for said conveyer adapted to alternately increase and decrease the linear speed of the conveyer, said driving mechanism being operated in timed relation to said stop members whereby the latter are actuated to stop the successive groups of containers during the period of reduced linear speed of said conveyer.

4. An automatic container handling machine having, in combination, a continuously moving endless conveyer belt upon which the containers to be processed are transported through the ma-

chine, movable means engageable with the containers for stopping them at a predetermined point on the conveyer belt while the belt continues to move, means for operating said stopping means, and positively operating driving means for said conveyer adapted to reduce the linear speed of the latter at predetermined intervals corresponding to the operation of said stopping means whereby to reduce to a minimum the impact between said stopping means and the containers when the latter are brought to rest.

5. In a conveyer of the character described, in combination, a continuously moving belt upon which the containers are transported, a movable stop member adapted to be projected into the path of said containers to bring them to rest on the conveyer while the belt continues to move, means for operating said stop member, and positively operating driving means for said conveyer adapted to reduce the linear velocity of said belt at predetermined intervals corresponding to the operation of said stopping means, said last named means comprising a rotary driving member arranged to be rotated at a uniform rate of speed, a rotary driven member connected to the conveyer belt, a flexible link connecting said driven member with said driving member, and a stationary cam cooperating with said flexible link arranged to vary the length of the latter during the rotation thereof, thereby varying the angular velocity of said driven member, said stop member actuated in timed relation to said belt speed in a manner such as to bring the containers to rest at the period of reduced velocity of said belt.

6. In a conveyer of the character described, in combination, a continuously moving belt upon which containers are transported in a line, a movable stop member engageable with the containers and adapted to separate the line into groups, a second movable stop member adapted to be operated to stop the group at a predetermined point while the belt continues to move, means for operating said stop members, and positively operating driving means for said conveyer adapted to accelerate and decelerate the velocity

of the conveyer belt at predetermined intervals, said stop members being operated in timed relation to said belt speed in a manner such as to bring the containers to rest at the period of reduced velocity of said belt.

7. In a conveyer of the character described, in combination, a continuously moving belt upon which the containers are transported, a movable stop member adapted to be projected into the path of said containers to bring them to rest on the conveyer while the belt continues to move, means for operating said stop member, and positively operating driving means for said conveyer adapted to reduce the linear velocity of said belt at predetermined intervals corresponding to the operation of said stopping means, comprising a rotary driving member arranged to be rotated at a uniform rate of speed, a rotary driven member, connections between said driving member and the conveyer, flexible means connecting said rotary driven member with said rotary driving member, and an eccentric member cooperating with said flexible means and adapted to vary the length of the latter during the rotation of the mechanism, thereby varying the angular velocity of said driven member.

8. The combination with a conveyer having provision for conveying containers in groups, of movable stop members adapted to be operated to bring successive groups of containers to rest on the conveyer while the latter continues in operation, means for operating said stop members, and positively operating driving mechanism for said conveyer adapted to alternately increase and decrease the linear speed of the conveyer, said driving mechanism being operated in timed relation to said stop members whereby the latter are actuated to stop the successive groups of containers during the period of reduced linear speed of said conveyer, said stop members being disposed in spaced relation along the conveyer a distance substantially equal to the distance traveled by said conveyer during one cycle of operation of the machine.

ARTHUR F. WHITEHEAD.