Aug. 1, 1967 E. C. SHERMAN 3,333,676

APPARATUS FOR GROUPING ARTICLES

Filed Nov. 23, 1965 3 Sheets-Sheet 1

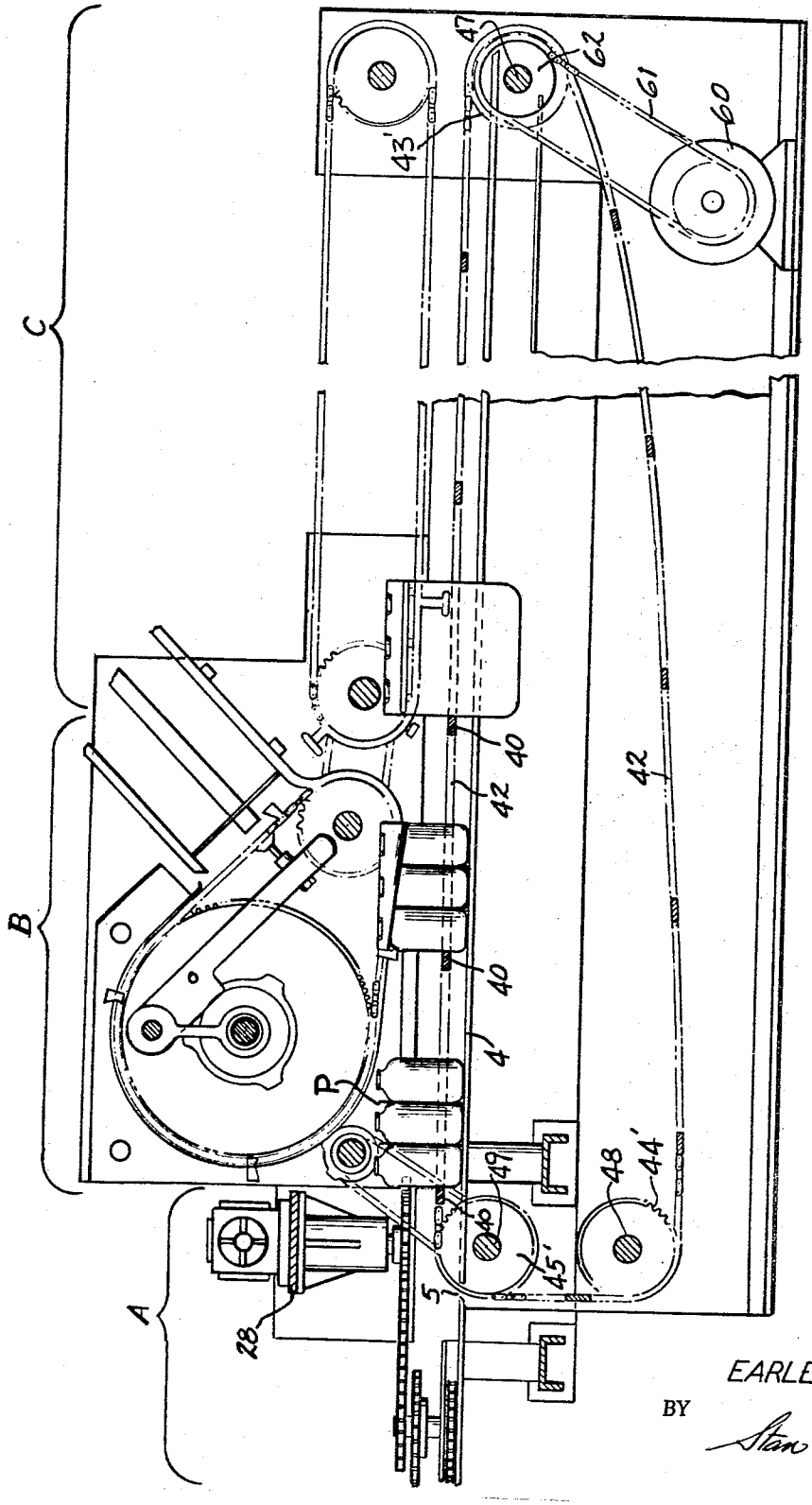

FIG-1

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APPARATUS FOR GROUPING ARTICLES

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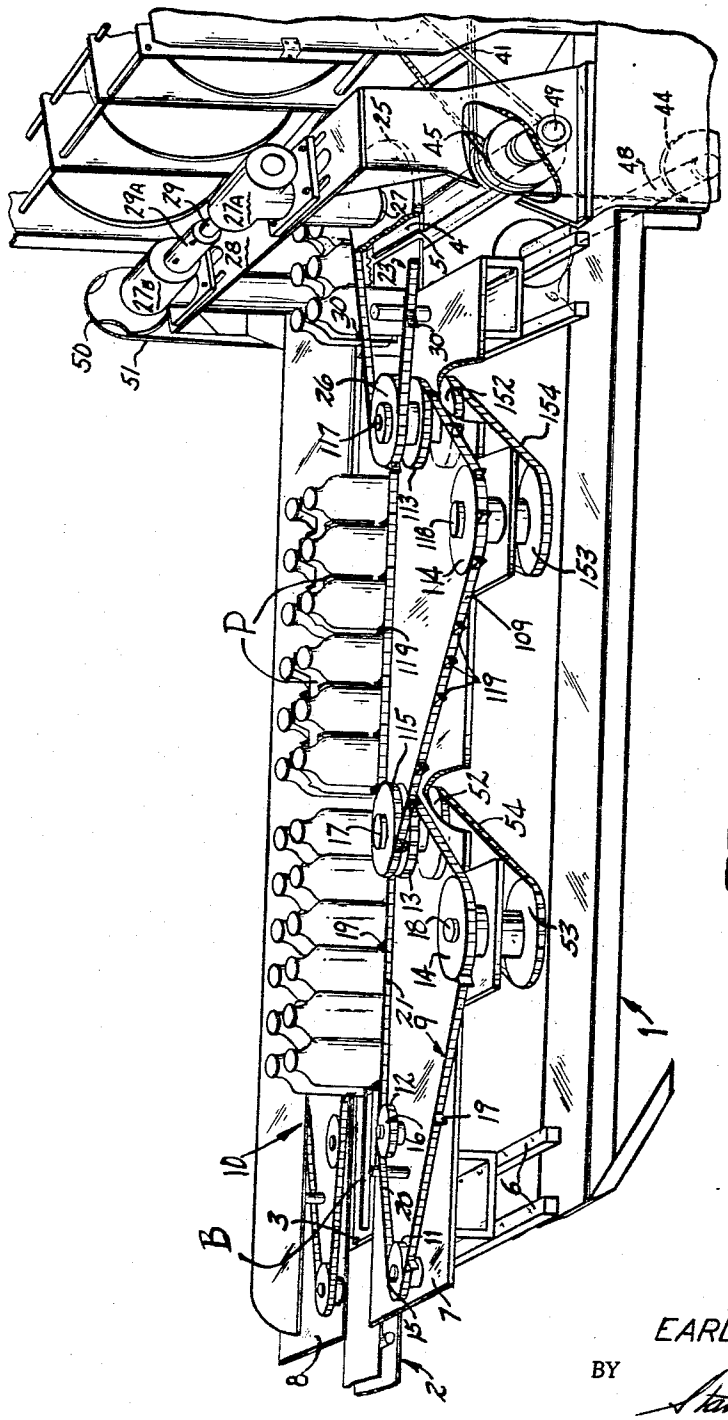

FIG-2

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APPARATUS FOR GROUPING ARTICLES

Filed Nov. 23, 1965 3 Sheets-Sheet 3

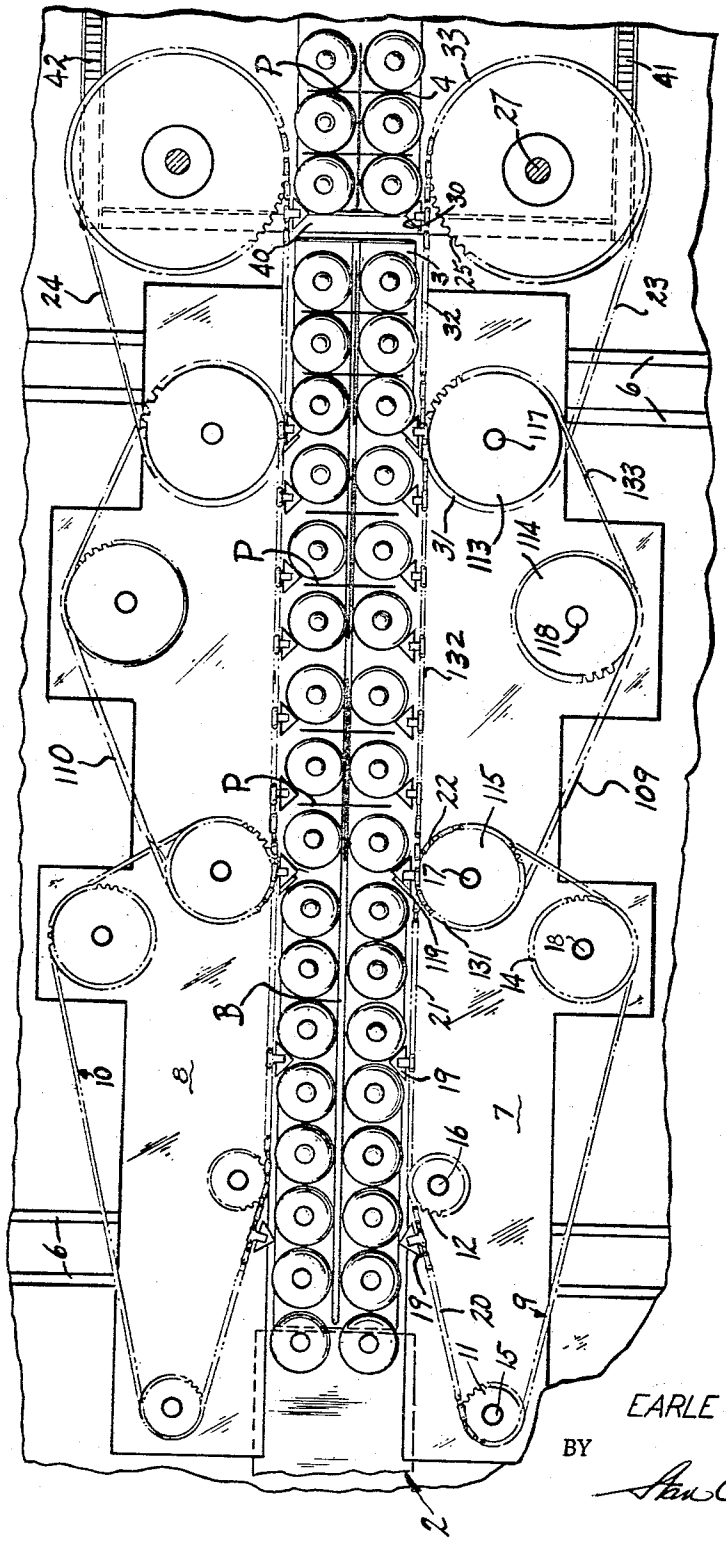

FIG-3

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3,333,676

APPARATUS FOR GROUPING ARTICLES

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Filed Nov. 23, 1965, Ser. No. 509,405
6 Claims. (Cl. 198—34)

ABSTRACT OF THE DISCLOSURE

This disclosure teaches an apparatus for forming package units by grouping a plurality of containers, inserting a partition to separate the containers one from another, and mechanically folding and interlocking a wrapper blank about the group The disclosure teaches a novel apparatus for first separating continuously moving rows of containers into groups into which a partition may be inserted and about which a wrapper blank can be folded and interlocked to form a package unit.

In apparatus according to this invention, containers are delivered to a packaging machine in one or more rows by a continuously moving conveyor. The packaging machine comprises three main sections which may be identified as:

(1) A grouping section in which one or more rows of containers are separated into spaced groups of two or more containers into which a partition may be inserted. The apparatus for so grouping the containers is described in detail in this application. The apparatus for applying partitions to such groups is described in detail in my copending application, S.N. 507,818, filed November 15, 1965.

(2) A blank applying section in which a wrapper blank is aligned with and placed on each group. Blank applying apparatus which may be used with this invention is described in detail in U.S. Patent 3,162,488, issued Dec. 29, 1964.

(3) A folding section wherein the wrapper blank is mechanically folded about the group and interlocked to form a package unit. Folding apparatus which may be used for this invention is described in detail in my copending application, S.N. 250,434, filed Jan. 9, 1963.

Various devices are known in the prior art for separating one or more moving rows of containers into groups. These devices take the form of separating plungers mounted on continuously moving chains, or stop members interposed at spaced intervals between moving rows of containers to hold back the rows while groups having a predetermined number of containers are formed. There are certain inherent disadvantages in the known prior art structures due to their relatively complicated design which makes them difficult to maintain and to adjust. The most serious disadvantage, however, is that the lines of containers being delivered to the machine encounter a momentary delay while they are grouped. The delay necessary for grouping reduces the overall speed and efficiency of the packaging machine, since the rate at which the containers can be grouped determines the overall speed at which the machine can run.

This invention discloses novel mechanism for grouping containers being fed to a packaging machine in one or more continuously moving lines which is simple in design, efficient in operation, and requires no momentary delay as the containers are grouped. The mechanism is furthermore readily adjustable to accommodate containers being fed to the machine in single or double rows and can be readily adjusted to provide groups of two or more containers for each package unit. Moreover, the grouping is such that a partition may be inserted into the group to separate the containers one from another. It is the structure which provides this latter feature that forms the basis of this application, and is an improvement over U.S. Patent 3,194,381.

To carry out this invention, three pairs of continuous chains are adjustably mounted on opposite sides of a pair of fixed support plates. The support plates extend longitudinally of the machine and are spaced from each other to provide a gap between the plates of predetermined width. The containers are moved in single or double rows toward the first support plate by conventional conveyor means and are moved onto the plate by conveyor pressure. A first pair of chains, designated selector chains, is mounted on opposite sides of the first support plate. Each of the selector chains is a continuous chain traveling in a fixed path around a plurality of sprockets, one of which is a driven sprocket. The path of travel of each selector chain includes a portion inclined toward the first support plate, a portion running parallel to the plate, and a portion inclined away from the plate.

Each selector chain is provided with a plurality of lugs adapted to engage a group of containers and propel the group along the plate. The lugs on each chain are spaced apart so that they will engage behind every second or third container in the row, depending on the number of containers desired in a package group. The selector chains thus initially select the number of containers that will be in the package group and drive these containers along as groups toward a second pair of chains. It should be understood that the lugs on one selector chain are laterally aligned with corresponding lugs on the other selector chain so that the containers are engaged on both sides of the support plates. It should also be noted that the selector chains are driven at the same speed as the conveyor which delivers the containers to the machine so that there is no delay or relative movement of the containers in the transfer from the conveyor to the selector chains.

A second pair of chains, designated intermediate spacer chains, is mounted generally forward of and above the selector chains on opposite sides of the support plates. Each of the intermediate spacer chains travels in a continuous path around two or more sprockets, one of which is a drive sprocket. The path of travel of each intermediate spaced chain includes a portion intersecting and aligned with a portion of the path of travel of a corresponding selector chain so that driving lugs on an intermediate spacer chain may engage each container of the group being delivered by the selector chains. Since the path of travel of the intermediate spacer chains is in a plane above the path of travel of the selector chains, it is possible to arrange for the smooth transfer of each container in a row from a group being driven by the selector chains to driving engagement with a lug on an intermediate spacer chain. The intermediate spacer chains accordingly include aligned lugs, one for each container in a group being delivered from the selector chains. The intermediate spacer chains are driven at a greater linear speed than the selector chains, and the lugs on the intermediate spacer chains are spaced apart a greater distance than the breadth of the container being driven. Accordingly, each container in a group is accelerated and separated from an adjacent container in the same row. It is this separation of the containers in a group which provides for space between the containers sufficient for insertion of a partition, as detailed in my copending application, S.N. 507,818, filed Nov. 15, 1965.

A third pair of chains, designated speed-up chains, is mounted generally forward of and in a different plane than the intermediate spacer chains on opposite sides of the support plates. Each of the speed-up chains travels in a continuous path around two or more sprockets, one of which is a drive sprocket. The path of travel of each speed-

up chain includes a portion intersecting and aligned with a portion of the path of travel of a corresponding intermediate spacer chain so that a driving lug on an intermediate spacer chain and a driving lug on a speed-up chain can engage a given container at the same point in the movement of the group along the support plate. Similar to the selector chain—intermediate spacer chain relationship, the path of travel of the speed-up chains is in a plane different than the path of travel of the intermediate spacer chains. Thus, it is possible to arrange for the smooth transfer of a group of spaced containers from driving engagement with lugs on the intermediate spacer chains to driving engagement with corresponding aligned lugs on the speed-up chains. The speed-up chains are driven at a still greater linear speed than the intermediate spacer chains, and include lugs to drive each group of containers; thus, the lugs on the speed-up chains are spaced apart a greater distance than the lugs on the selector chains. The speed-up chains accelerate the containers as a group so that relative movement occurs between the containers driven by the speed-up chains and the following containers driven by the intermediate spacer chains. The containers of a group are thus allowed to become more closely associated, spaced apart only by the partition previously inserted. Concurrently, the groups of containers are thus spaced from each other by the speed-up chains and the grouping of the containers is completed.

Each spaced group of containers is driven by the speed-up chains across the gap between the first and second support plates. As the group is propelled across the gap, the path of travel of the speed-up chains diverges away from the support plates and the lugs of the speed-up chains disengage from the group. At this point a flight bar extending transversely across the path of travel of the containers moves into the space between two spaced groups of containers and engages behind the first group to propel the group through the succeeding stations of the machine. The flight bars are arranged so that there is a flight bar ready to engage each group of containers as it is disengaged by the speed-up chains.

These and other features of this invention will now be described in detail with reference to the drawings, in which:

FIGURE 1 is a sectional side view of a portion of the machine above described;

FIGURE 2 is a perspective view showing the grouping section of the machine of this invention in detail; and,

FIGURE 3 is a top plan view showing the details of the grouping section of the machine of this invention.

The packaging machine of this invention comprises three main sections, portions of which are shown in FIGURE 1 as a grouping section (A), a blank applying section (B), and a folding section (C).

The grouping section of this invention is shown in FIGURE 2 as being mounted on the base, generally indicated **1**, of a packaging machine at the rear end thereof. Containers are delivered in one or more rows to the machine by a conventional conveyor, generally indicated **2**. The containers are moved by the conveyor **2** onto a first rigid plate **3**, the plate **3** including if so desired a divider bar B to space the rows of containers one from another. A second rigid plate **4** is mounted on frame **1** forward of plate **3** and is spaced from plate **3** to provide a gap **5** between the plates. (Note FIGURE 3.) Plate **4** extends forwardly beyond the grouping section, into the blank applying section B and on into the folding section C of the machine. (Note FIGURE 1.)

Extending transversely across base **1** are a plurality of support members **6**. Slidably mounted on the support members on opposite sides of rigid plate **3** are a pair of support plates **7** and **8**. Each of the support plates **7** and **8** is movable into partial overlapping relation with rigid plate **3**.

The adjustable mounting of the support plates allows the grouping apparatus to be moved toward and away from rigid plate **3** in order to accommodate a single row of containers or a double row of containers moving into the grouping section of the machine.

The grouping apparatus in general includes three pairs of chains, now to be described in detail. Since the grouping apparatus on one side of the rigid plate **3** is identical to the grouping apparatus on the opposite side of the rigid plate, it will only be necessary to describe the apparatus on one side in detail.

Selector chains

A first pair of chains generally indicated **9** and **10**, designated selector chains, is mounted on opposite sides of rigid plate **3**. Chain **9** is a continuous chain mounted for movement in a fixed path about a plurality of sprockets. The sprockets include idler sprockets **11**, **12** and **13** and a drive sprocket **14**. (Note FIGURE 2.) Sprockets **11**, **12**, **13** and **14** are mounted on shafts **15**, **16**, **17** and **18**, respectively. Each of the shafts is mounted on support plate **7** in a conventional manner.

Chain **9** is provided with a plurality of drive lugs **19** spaced a predetermined distance apart. The lugs are arranged to engage behind the last container of a predetermined number of containers to drive the containers as a group along rigid plate **3**. The lugs **19** on chain **9** initially select the number of containers which will constitute the package unit. The number of containers in the group can be adjusted merely by adjusting the spacing of lugs **19**.

Chain **9** is mounted so that a portion **20** of the chain converges toward rigid plate **3**. This allows lugs **19** to be smoothly interposed behind the last container of the selected group to drive that particular group along rigid plate **3**. A second portion **21** of chain **9** runs parallel to rigid plate **3**. A third portion **22** of chain **9** diverges away from rigid plate **3** so that the driving lugs on the chain can be smoothly disengaged from the containers.

It should be noted at this point that chain **9** is driven at the same speed as conveyor **2**, so that no relative movement occurs between the containers driven onto the plate by the conveyor **2** and those being driven by the lugs on chain **9**. There is continuous uninterrupted movement of the containers along rigid plate **3**.

Intermediate spacer chains

A second pair of chains generally indicated **109** and **110**, designated intermediate spacer chains, is mounted generally forward of selector chains **9** and **10** on opposite sides of the rigid plates **3** and **4**. Intermediate spacer chain **109** is a continuous chain mounted on sprockets **113**, **114** and **115**. Sprocket **115** is mounted on shaft **17** along with and above sprocket **13** of selector chain **9**. Sprocket **114** is a drive sprocket mounted on a vertically extending shaft **118**, and sprocket **113** is an idler sprocket mounted on a shaft **117**.

Intermediate spacer chain **109** is provided with a plurality of drive lugs **119** each adapted to engage a container in the same manner as drive lugs **19** on chain **9**. Chain **109** includes a portion **131** converging towards rigid plate **3**, a portion **132** running parallel to rigid plate **3**, and a portion **133** diverging away from rigid plate **3** to facilitate the entry, driving engagement, and disengagement of the lugs **119** with the containers in a manner similar to chain **9**. However, the lugs **109** are such in number and spacing as to engage each of the containers of the group being driven by lugs **19**, for reasons to become apparent shortly. Thus, as the leading container of a group on chain **9** approaches sprocket **115**, a lug **119** engages such container, this process being repeated for each container in the group until a lug **119** coincides with a lug **19** behind the last container of a group. This arrangement allows the smooth transfer of the containers from selector chain **9** to intermediate spacer chain **119**.

Chain **119** is driven at a higher speed than selector chain **9**. The difference in speed of the chains produces relative movement between those containers driven by

the selector chain **9** and those driven by the intermediate spacer chain **119**. The relative movement causes a space to develop between each of the containers and separates them a predetermined distance. To compensate for the relative movement of the containers, the driving lugs **119** on the intermediate spacer chain are spaced apart a greater distance than the driving lugs **19** on the selector chains.

It is at this point that the partition discussed hereinbefore is inserted. Employing apparatus such as that disclosed in my copending application S.N. 507,818, filed Nov. 15, 1965, a partition may be inserted into the space between the containers provided by the intermediate spacer chains **119**, it being evident that space between the rows of containers is provided by the divider bar B. The inserted partition, indicated as P, is then free to travel along with the group of containers in which it is inserted.

Speed-up chains

A third pair of chains generally indicated **23** and **24**, designated speed-up chains, is mounted generally forward of intermediate spacer chains **109** and **110** on opposite sides of the rigid plates **3** and **4**. Speed-up chain **23** is a continuous chain mounted on a pair of sprockets **25** and **26**. Sprocket **26** is mounted on shaft **17** along with, but in a different plane than, sprocket **113** of intermediate spacer chain **109**. While the sprocket **26** may be mounted below sprocket **113**, it is here illustrated as being above. Sprocket **25** is a drive sprocket mounted on a vertically extending shaft **27**. Vertical shaft **27** depends from a miter box **27A** mounted on a support member **28** which extends transversely across the machine above rigid plate **4**. A horizontal drive shaft **29** mounted on top of support member **28** is connected by conventional gear means mounted in miter box **27A** to vertical shaft **27**. Vertical shaft **27** is adjustably mounted relative to support **28** so that sprocket **25** can be adjusted laterally along with the sprockets mounted on support plate **7**. The adjustable mounting includes a plurality of slots in support plate **28** and an adjustable sleeve **29A** for shaft **29**.

Speed-up chain **23** is provided with drive lugs **30** adapted to engage a group of containers in a manner similar to drive lugs **19** on chain **9**. Chain **23** includes a portion **31** converging towards rigid plate **3**, a portion **32** running parallel to rigid plate **3** and a portion **33** diverging away from rigid plate **3** to facilitate the entry, driving engagement, and disengagement of the lugs **30** with the containers in the same manner as chain **9**. The chain **23** is arranged relative to the chain **109** such that a lug **30** on the chain **23** engages a group of containers being delivered by chain **119**. Thus, the containers of a group selected by the selector chain **9** are first separated by the intermediate spacer chain **119** for insertion of a partition. As the leading container of a group is disengaged from chain **119**, its motion ceases until a following container moves forward and forces the leading container forward. This process is repeated for each container until the last, when a lug **30** on the speed-up chain **23** coincides with a lug **119** on the intermediate spacer chain lug behind the last container of a group. This arrangement allows the smooth transfer of the containers from intermediate spacer chain **109** to speed-up chain **23**, and also serves to decrease the space between adjacent containers created by the intermediate spacer chain **109**. Since the partition is in place, such space is no longer required, and the containers may again be driven along as a group.

Speed-up chain **23** is driven at a higher speed than intermediate spacer chain **109**. The difference in speed of the chains produces relative movement between those containers driven by the intermediate spacer chain **109** and those driven by the speed-up chain. The relative movement causes a space to develop between adjacent groups of containers being delivered by the intermediate spacer chain **109** and separates them into the groups which will comprise the package units. To compensate for the relative movement of the containers, the driving lugs **30**

on the speed-up chain are spaced apart a greater distance than the driving lugs **19** on the selector chains.

The groups of containers, each including a partition, are thus spaced from each other by the speed-up chains and the grouping of the containers is completed.

Subsequent operations

The spaced groups of containers are driven by speed-up chains **23** and **24** across the gap **5** between rigid plates **3** and **4**. As a given group of containers is driven across gap **5** it is disengaged by the lugs of the speed-up chains as they diverge away from the containers.

Coincident with the disengagement of the containers by lugs **30**, the containers are engaged by a flight bar **40** which drives the containers spaced groups through the succeeding sections of the machine.

Flight bars **40** are disposed transversely of the machine and travel in a continuous path which extends above and below rigid plate **4**. (Note FIGURE 1.) The flight bars are mounted between a pair of laterally spaced continuous flight chains **41** and **42**. Flight chain **41** is mounted on a plurality of sprockets **43**, **44** and **45** which are in turn mounted on shafts **47**, **48** and **49** journalled in the side frames of the machine. Sprockets **44** and **45** are shown in FIGURE 2. Sprocket **43** is not shown. Flight chain **42** is mounted on a plurality of sprockets **43'**, **44'** and **45'** which are also mounted on shafts **47**, **48** and **49** respectively. (Note FIGURE 1.) As is apparent from FIGURE 1 of the drawings each flight bar **40** travels in a continuous path around rigid plate **4**. The spacing and speed of the flight bars is arranged so that a flight bar moves up through gap **5** into engagement with a group of containers just as the containers are released by the lugs of the speed-up chains. The flight bar propels the grouped containers through the blank applying section B and through the folding section C of the machine.

The flight bars **40** drive the group of containers at the same speed as they leave the speed-up chains **23** and **24**. Thus there is no relative movement between the groups of containers leaving the speed-up chains and those groups of containers being driven by the flight bars. The flight bars are positioned to maintain the spacing between the groups of containers.

Power system

The flight bars and all the chains previously discussed are driven from a common power source **60** by an arrangement of sprockets and chains which will now be described. By driving these elements through a common power source the problem of coordinating the relative speed of these elements is minimized since the speed of a single drive motor is constant, whereas in those arrangements where several drive motors are used the relative speed of the drives varies and poses a coordinating problem.

Referring now to FIGURE 1, electric motor **60** is connected to shaft **47** by means of chain **61** and a sprocket **62** which is mounted adjacent sprocket **43**. Shaft **47** in turn drives flight chains **41** and **42**. Flight chains **41** and **42** drive shafts **48** and **49** through their respective sprockets as shown in FIGURE 1. A sprocket (not shown) is mounted on shaft **49** adjacent sprocket **45** and is connected to a sprocket **50** on shaft **29** by means of chain **51**. (Note FIGURE 2.) Shaft **29** drives shaft **27** through the gears (not shown) in miter box **27A**. Once again only the driving arrangement of the speed-up chain and selector chain on one side of the rigid plates will be described, it being apparent that the drive on the other side of the rigid plates through the other miter box **27B** is identical in operation. Shaft **27** drives sprocket **25** which drives speed-up chain **23**. The speed-up chain **23** drives sprocket **26** which is keyed to shaft **117**. Shaft **117** mounts idler sprocket **113** which is free to rotate relative to the shaft. Keyed to shaft **117** below plate **7** is another sprocket **152**. (Note FIGURE 2.) Sprocket **152**

drives shaft **118** through sprocket **153** and drive chain **154**. Shaft **118** has keyed thereto sprocket **114** which drives the intermediate spacer chain **109**, which is mounted on drive sprocket **114**, idler sprocket **113**, and sprocket **115** keyed to shaft **17**.

Similar to the relationship for the intermediate spacer chain as described above, shaft **17** mounts idler sprocket **13** which is free to rotate relative to the shaft. Keyed to shaft **17** below plate **7** is another sprocket **52**, which drives shaft **18** through sprocket **53** and drive chain **54**. Shaft **18** has keyed thereto above the plate **7** sprocket **14** which drives the selector chain **9**, which is mounted on drive sprocket **14** and idler sprockets **11**, **12** and **13**.

By the arrangement of chains above described, it is possible through appropriate design of the sprocket sizes to have the selector chains, intermediate spacer chains, speed-up chains, and flight bars driven at predetermined different relative speeds from the same power source, motor **60**.

It is to be understood that the invention is not limited to the illustrations described and shown herein which are deemed to be merely illustrative of the best modes of carrying out the invention, and which are susceptible of modifications of form, size, arrangement of parts and detail of operation, but rather is intended to encompass all such modifications which are within the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. Apparatus for separating continuously moving rows of containers into groups of containers, comprising: container supporting plate,

(A) a first pair of selector means mounted for continuous movement in a horizontal plane above and on opposite sides of said plate,

(B) first lug means on each of said first pair of selecetor means adapted to engage a plurality of said containers defining a group and to propel said group along said plate,

(C) a second pair of spacer means mounted for continuous movement in a horizontal plane generally forward of said first pair of selector means,

(D) second lug means on each of said second pair of spacer means adapted to engage each of said containers of said group and to propel each of said containers along said plate, said second lug means being mounted on each of said second pair of spacer means a greater distance apart than the breadth of one of said containers,

(E) common drive means adapted to drive said second pair of spacer means at a greater speed than said first pair of selector means to provide spaced intervals between said containers,

(F) a third pair of speed-up means mounted for continuous movement in a horizontal plane generally forward of said second pair of spacer means,

(G) third lug means mounted on each of said third pair of speed-up means adapted to engage said group and propel said group along said plate, said third lug means being spaced apart a greater distance than the lug means on each of said first pair of selector means, and

(H) common drive means adapted to drive said third pair of speed-up means at a greater speed than said second pair of selector means.

2. Grouping apparatus comprising:

(A) a rigid plate,

(B) conveyor means delivering containers in rows to said plate,

(C) selector means mounting first spaced drive lugs for continuous movement in fixed horizontal paths on opposed sides of said plate, said first drive lugs being spaced to engage a plurality of containers in a row defining a group of containers,

(D) spacer means mounting second spaced drive lugs for continuous movement in fixed horizontal paths on opposite sides of said rigid plate, said second drive lugs being spaced to engage each container in said group, the paths of movement of said first drive lugs and second drive lugs intersecting at a common point to effect the transfer of each of the containers in said group from said first drive lugs to said second drive lugs, said second drive lugs being spaced from each other a distance greater than the breadth of each of said containers,

(E) common drive means propelling said spacer means at a greater linear speed than said selector means,

(F) speed-up means mounting third spaced drive lugs for continuous movement in fixed horizontal paths on opposite sides of said rigid plate, said third drive lugs being spaced to engage said group, the paths of movement of said second drive lugs and said third drive lugs intersecting at a common point to effect the transfer of said group from said second drive lugs to said third drive lugs, said third drive lugs being spaced from each other a greater distance than said first drive lugs, and

(G) common drive means propelling said speed-up means at a greater linear speed than said spacer means.

3. Apparatus for grouping rows of containers being delivered onto a rigid plate by a conveyor comprising: a container supporting plate,

(A) a pair of selector chains,

(B) sprocket means mounting each of said selector chains for movement in a continuous horizontal path above and on opposite sides of said plate,

(C) lug means on each of said selector chains arranged to engage behind a group of containers on said plate to drive said group a predetermined distance along said plate and to disengage from said containers,

(D) a pair of spacer chains,

(E) sprocket means mounting each of said spacer chains on opposite sides of said plate for movement in a continuous horizontal path,

(F) lug means on each of said spacer chains arranged to engage behind each of the containers in said group as they are disengaged by said selector chains to drive said containers a predetermined distance along said plate and to disengage from each of said containers, said drive lugs on each of said spacer chains being spaced apart a greater distance than the breadth of the engaged container,

(G) means driving said spacer chains at a greater linear speed than said selector chains, the difference in speed and lug spacing of said selector chains and spacer chains being effective to arrange said containers into groups having a predetermined number of spaced containers in each group,

(H) a pair of speed-up chains,

(I) sprocket means mounting each of said selector chains for movement in a continuous horizontal path on opposite sides of said plate,

(J) lug means on each of said speed-up chains arranged to engage behind said group as the containers of said group are disengaged by said spacer chains, said drive lugs on each of said speed-up chains being spaced apart a greater distance than said lugs on each of said selector chains, and

(K) means driving said speed-up chains at a greater linear speed than said spacer chains, the difference in speed and lug spacing of said speed-up chains and spacer chains being effective to arrange said containers into spaced groups having a predetermined number of containers in each group.

4. Apparatus for separating continuously moving rows of objects into package groups comprising: a container supporting plate,

(A) first conveyor means continuously moving rows of objects forward onto said plate,

(B) a first pair of laterally spaced selector means having lug means thereon adapted to engage a group of said objects at spaced diametrically opposed intervals and to propel said group along said plate,

(C) a second pair of laterally spaced intermediate spacer means having lug means thereon adapted to engage and propel each object in said group along said plate, said lug means on each of said intermediate spacer means being spaced apart a distance greater than the breadth of each object in a row,

(D) means driving said second pair of intermediate spacer means at a greater speed than said first pair of selector means to accelerate the objects in a group, the difference in speed and the spacing of the lugs of said second pair of intermediate spacer means being effecetive to create a space between adjacent objects in a row of said group, said space being sufficient for insertion of a partition therein,

(E) a third pair of laterally spaced speed-up means having lug means thereon adapted to engage and propel said group along said plate, said lug means on each of said third pair of speed-up means being spaced a greater distance apart than the lug means on each of said first pair of selector means,

(F) means driving said third pair of speed-up means at a greater speed than said second pair of intermediate spacer means, the difference in speed and the spacing of said lug means on said third pair of speed-up means being effective to decrease the space between adjacent objects in a row of said group and to accelerate said groups as spaced package groups each containing a predetermined number of units.

5. The apparatus of claim 4 including second conveyor means adapted to engage in the space between said groups to drive the groups beyond said third pair of speed-up means.

6. Apparatus according to claim 4 further including

(A) a pair of speed-up chains,

(1) adjustable sprocket means mounting each of said speed-up chains for movement in a fixed path generally above and forward of said spacer chains,

(2) each of said speed-up chains being provided

with a plurality of drive lugs spaced apart a distance greater than the drive lugs on each of said selector chains,

(3) the path of movement of each of said speed-up chains including,

(a) a portion converging toward said plates,

(b) a portion running parallel to said plates, and

(c) a portion diverging away from said plates, the paths of movement of said speed-up chains and said spacer chains intersecting at a common point so that as a drive lug on said spacer chains disengages said group of containers a drive lug on said speed-up chains will engage said group,

(B) common drive means propelling said speed-up chains at a greater speed than said spacer chains to accelerate the groups of containers being driven by the spacer chains, the difference in spacing of the drive lugs on the speed-up chains and the spacer chains and the difference in speed of the spacer chains and speed-up chains being effective to arrange the containers into spaced groups having a predetermined number of containers separated by a distance less than said predetermined distance,

(C) a second container supporting plate mounted generally forward of said first container supporting plate and spaced therefrom,

(D) conveyor means adapted to pass through the space between said first and said second plates to engage said groups of containers as they are disengaged by the drive lugs on said speed-up chains.

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