Feb. 12, 1963 W. BRUMBAUGH 3,077,062

PACKAGING APPARATUS AND METHOD

Filed Aug. 26, 1960 4 Sheets-Sheet 1

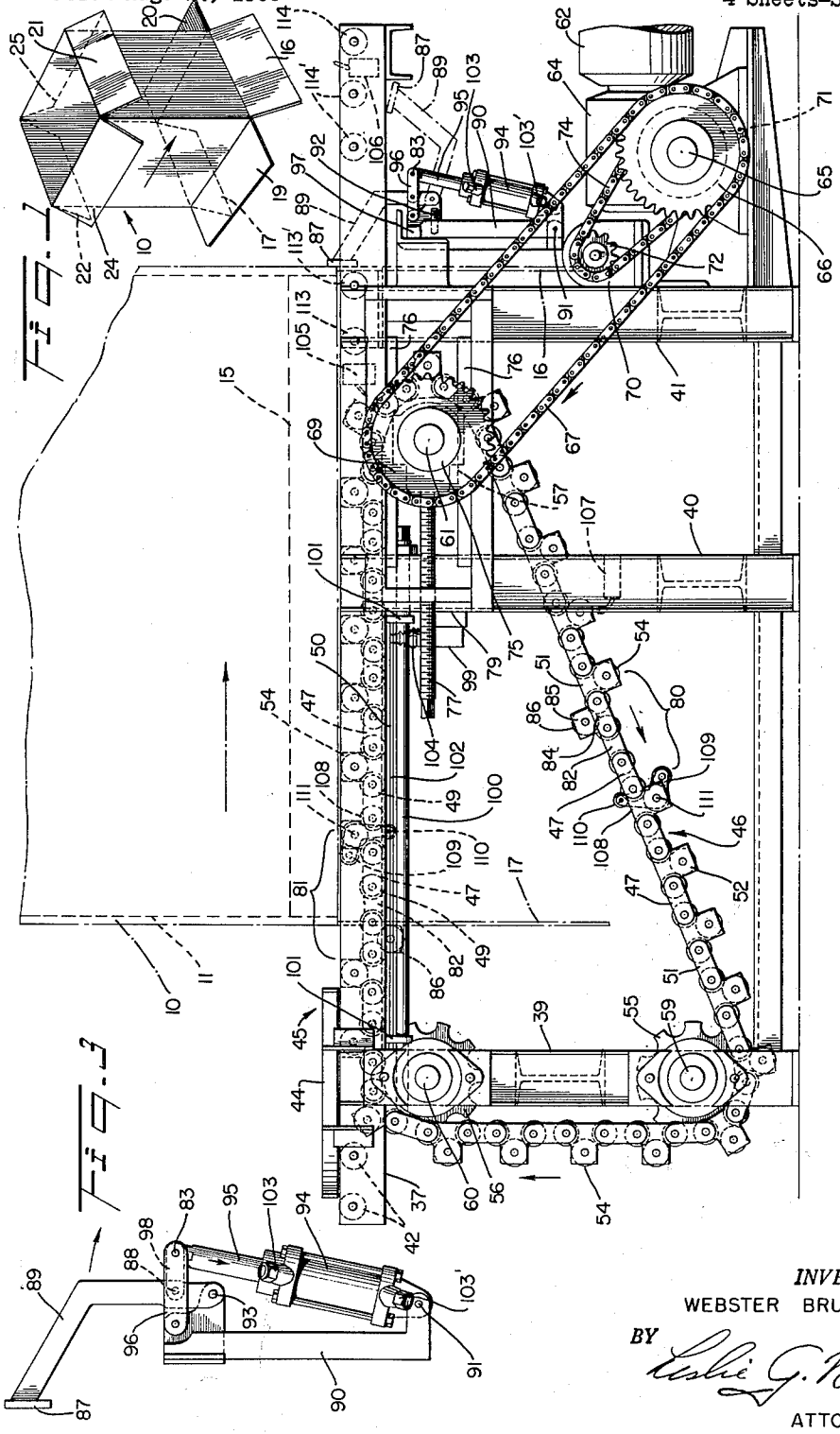


Fig. 2

Fig. 3

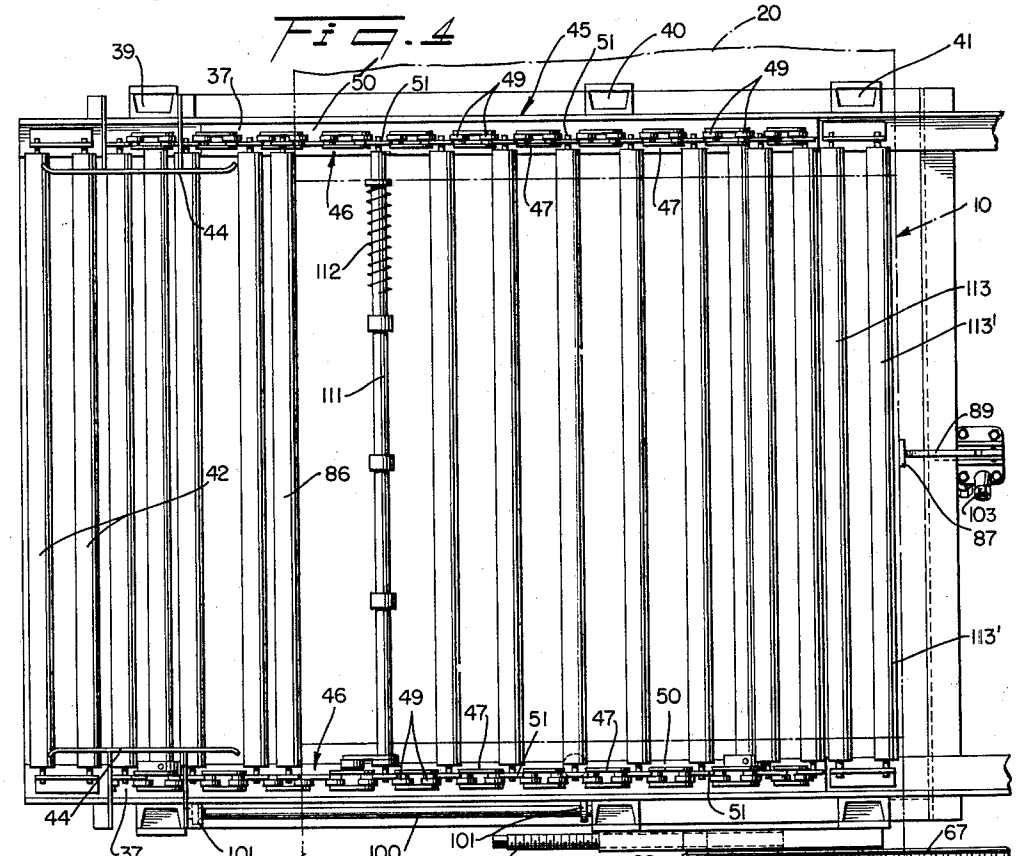
INVENTOR.
WEBSTER BRUMBAUGH
BY Leslie G. Noller
ATTORNEY

Feb. 12, 1963 W. BRUMBAUGH 3,077,062

PACKAGING APPARATUS AND METHOD

Filed Aug. 26, 1960 4 Sheets-Sheet 2

Fig. 4



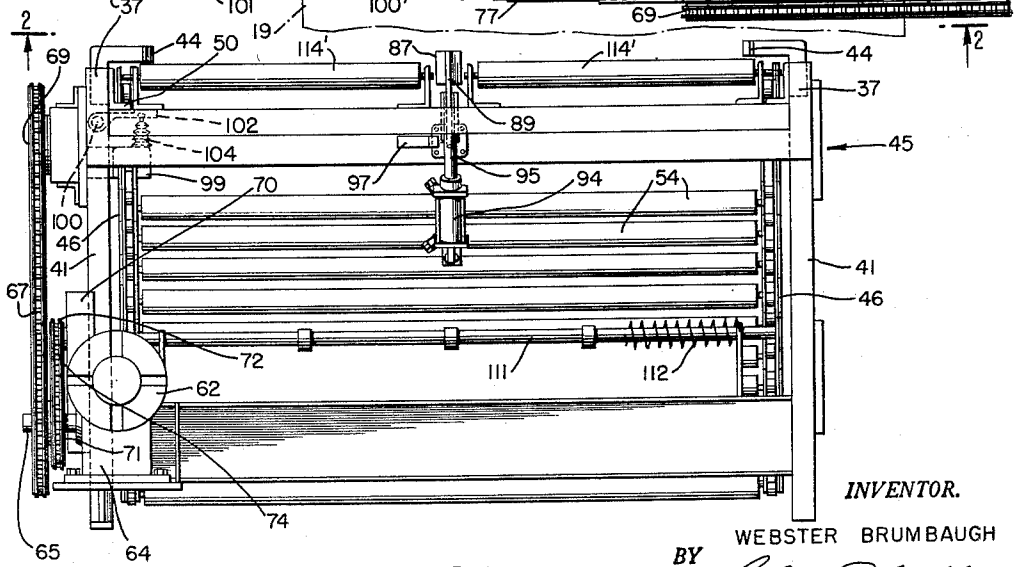


Fig. 5

INVENTOR.

WEBSTER BRUMBAUGH

BY Leslie G. Waller

ATTORNEY

Feb. 12, 1963 W. BRUMBAUGH 3,077,062

PACKAGING APPARATUS AND METHOD

Filed Aug. 26, 1960 4 Sheets-Sheet 3

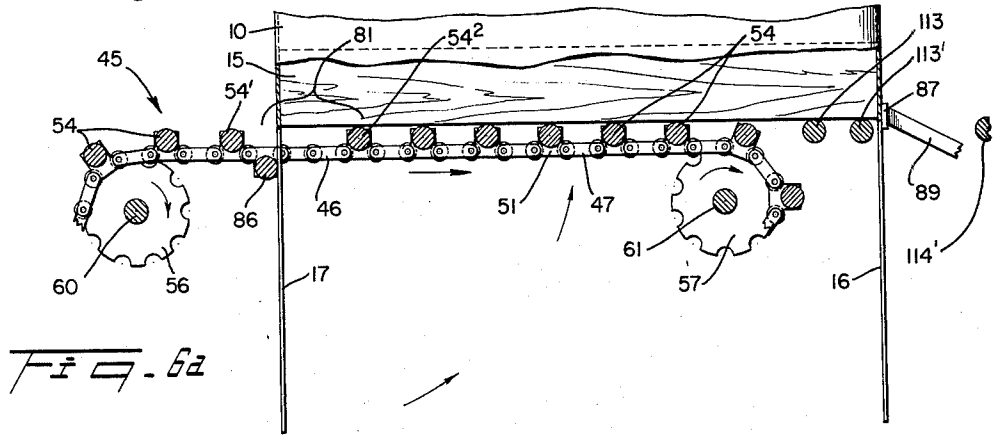


Fig. 6a

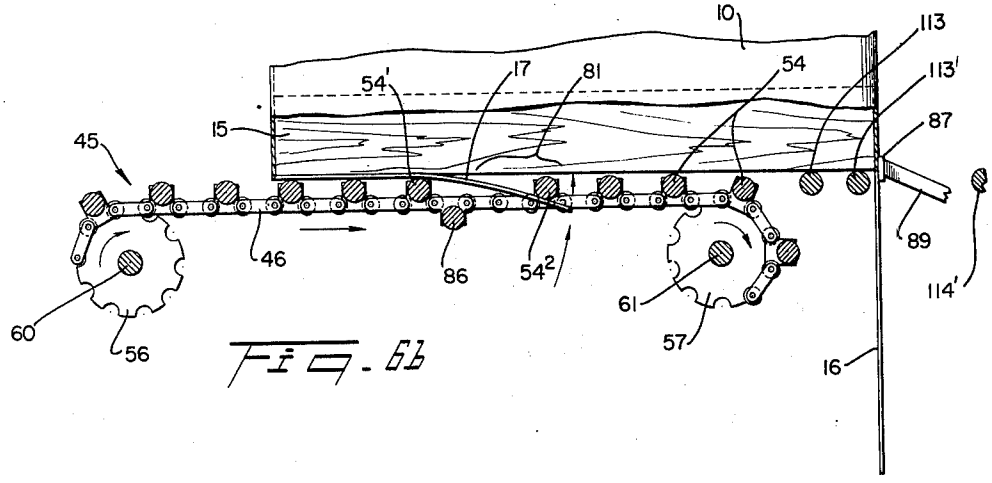


Fig. 6b

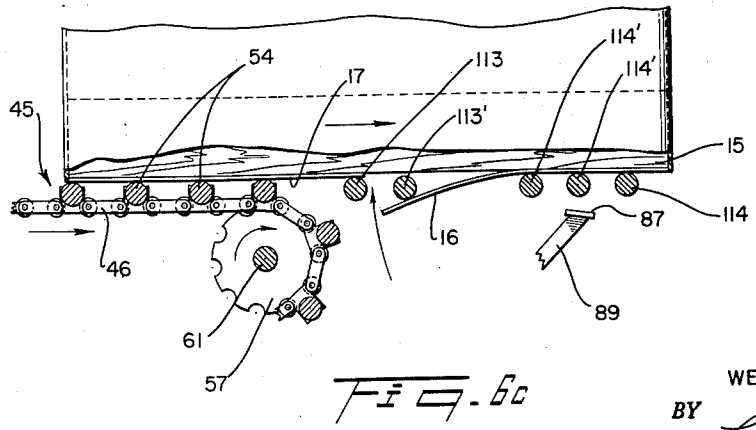


Fig. 6c

INVENTOR.
WEBSTER BRUMBAUGH
BY Julius G. Moller
ATTORNEY

Feb. 12, 1963 W. BRUMBAUGH 3,077,062

PACKAGING APPARATUS AND METHOD

Filed Aug. 26, 1960 4 Sheets-Sheet 4

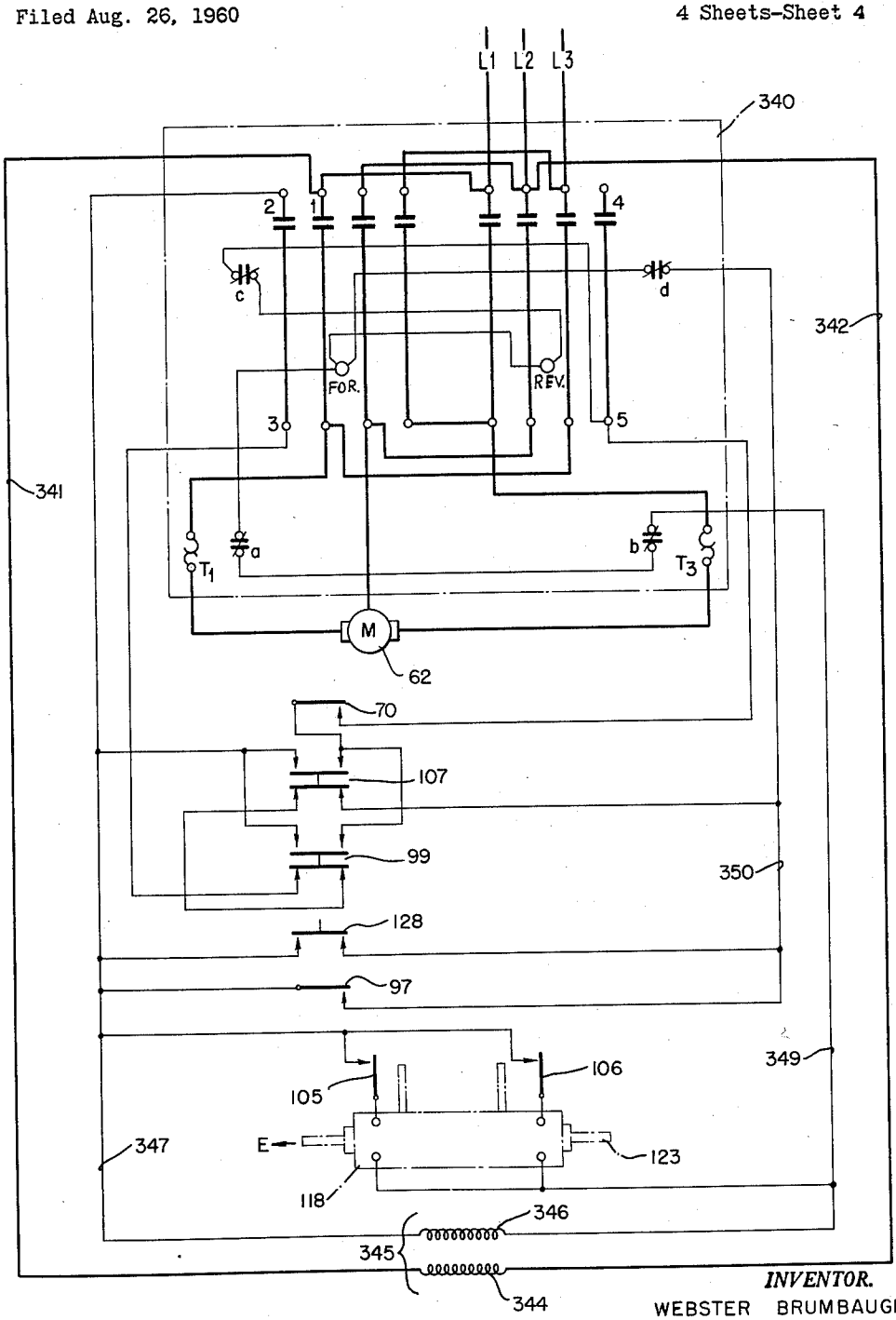


Fig. 1

INVENTOR.
WEBSTER BRUMBAUGH

BY Leslie G. Moller
ATTORNEY

United States Patent Office 3,077,062 Patented Feb. 12, 1963

3,077,062

PACKAGING APPARATUS AND METHOD

Webster Brumbaugh, Chicago, Ill., assignor to Weyerhaeuser Company, Tacoma, Wash., a corporation of Washington

Filed Aug. 26, 1960, Ser. No. 52,099
14 Claims. (Cl. 53—37)

This invention relates to novel packaging apparatus and to a novel method of packaging. The invention more particularly relates to the packaging of large heavy objects of which washing machines, dryers, and stoves are representative.

The invention has among its objects the provision of an improved apparatus for and method of packaging articles, particularly articles which are large and heavy.

A particular object is the provision of a novel simplificated apparatus for folding the lower trailing and leading end flaps of a carton beneath an article being packaged while the article remains supported from below.

A further object of the invention lies in the provision of apparatus of the character indicated which is automatically adjusted to the processing of cartons of different lengths in the direction of their travel through the apparatus.

A still further object of the invention is the provision of a novel method of folding the lower trailing and leading end flaps of a carton beneath an article.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

FIG. 1 is a view in perspective of a carton in the condition which it has after having been telescoped over the article to be enclosed within the carton;

FIG. 2 is a view in side elevation of the flap folding apparatus of the invention;

FIG. 3 is a fragmentary, somewhat enlarged, view in side elevation of the selectively operated stop mechanism adjacent the exit end of the apparatus of the invention;

FIG. 4 is a fragmentary view in plan of the apparatus of the invention;

FIG. 5 is a view in end elevation of the portion of the apparatus shown in FIG. 4, the view being taken in the direction from right to left in FIG. 4;

FIG. 6*a* is a diagrammatic view showing the initial position of the parts at the beginning of the operation of folding the trailing bottom end flap of a carton beneath an article by the apparatus of the invention;

FIG. 6*b* is a view similar to FIG. 6*a* but with the parts shown in the position which they occupy as the folding operation performed on the trailing bottom end flap nears its end;

FIG. 6*c* is a schematic diagram of the apparatus illustrating the folding of the leading bottom end flap; and

FIG. 7 is a wiring diagram for the operating mechanism of the packaging apparatus of the invention.

It is becoming an increasingly common practice to ship large heavy objects such as washing machines and stoves in paperboard cartons rather than in wooden crates. There are a number of reasons for such change, among them being economy of packaging, the saving of weight and space, and the completeness of coverage and protection of the article. The use of paper-board cartons in the packaging of articles of the type indicated

introduces various problems into the packaging operation, particularly when it is desired continuously to support the article from below while folding the bottom flaps of the container upwardly beneath the article. The apparatus of the present invention solves the problem of the folding of the bottom flaps of the carton in a novel and efficient manner. The apparatus of the invention is particularly adapted for the treatment of a plurality of preliminarily packaged articles fed thereto in sequence. The apparatus is self-adjusting to treat cartons having a variety of different lengths, and thus may be used to advantage in a packaging line of a factory producing articles which vary in size within an appreciable range.

Before describing the apparatus of the invention, first generally, and then in detail, it will be well to describe a carton such as that processed by the apparatus, and typical articles to be packaged therein. In FIG. 1 there is shown a paperboard carton 10 in open, unfilled condition, in much the same condition which it has after it has been first applied to the article. The article to be packaged, fragmentarily shown in FIGS. 2, 6*a*, 6*b*, and 6*c*, is generally designated 11.

The articles to be packaged in accordance with the invention, that is, articles such as that shown at 11, are provided with skids 15 integrally attached to the base of the article and travelling therewith until it reaches its ultimate destination. The article to be packaged, mounted upon its skid, is supported from below in such manner that the opened bottomed container 10, in the condition shown in FIG. 1, may be telescoped thereover. Following this, the apparatus of the invention folds trailing bottom flap 17 of carton 10 up into horizontal position beneath the skid 15 of the article, and then folds the leading bottom flap 16 up into horizontal position beneath the article. Subsequently used apparatus, not the subject of the present invention, may thereafter fold the trailing and leading upper flaps 22 and 21, respectively, inwardly into horizontal position over the article, apply glue or other suitable adhesive to the outer lower and upper side flaps 19 and 24, respectively, and the inner, lower and upper side flaps 20 and 25, respectively, and then fold such coated side flaps over the ends of the carton and press them against each other in sealing relationship. Such subsequently used apparatus may be that, for example, disclosed in the application of James B. Rodman, entitled "Packaging Apparatus," Serial No. 52,287, filed August 26, 1960, assigned to the assignee of the instant application.

The bottom flap folding apparatus of the present invention has a table-like frame structure with parallel horizontal upper longitudinal members 37 which are tied together by suitable cross frame members, as indicated. The upper frame structure is supported on a rear vertical support 39, an intermediate support 40, and a forward vertical support 41, such vertical supports being made up of suitable vertical and horizontal frame members. The entering (left hand) end of the apparatus is provided with a plurality (two shown) of idle conveyor rollers 42 which are disposed at the same height as similar prior conveyors (not shown) by means of which the articles to be packaged may be presented to the apparatus of the invention. At the entering end of such apparatus, and partially overlying conveyor rolls 42, are two short oppositely disposed horizontal article-centering guides 44. Conveyor rolls 42 and guides 44 present the article in the proper position upon the entering end of an endless driven chain type conveyor generally designated 45, which is supported upon the above-described framework of the apparatus.

Conveyor 45 includes two identical laterally spaced chains 46 which partially overlie the horizontal track-

forming flange 50 of the respective longitudinal member 37 of the frame. The chains 46 are connected to travel in synchronism, by means to be described, in the direction of the arrow in FIG. 2, that is, with the upper runs of the chains travelling in a direction from left to right of that figure. Each of chains 46 has a plurality of longitudinally spaced main links 47, which carry rollers 49 which roll along the aforesaid supporting flanges 50. Links 47 are connected by interposed intermediate links 51. Each of intermediate links 51 has an upstanding ear or bracket 52 thereon, opposing brackets 52 of the two chains journalling an article-supporting roller cross bar 54 therebetween. The configuration and size of parts is such that, in the upper run of the conveyor 45, the upper surfaces of rollers 54 lie at the same level as the upper surfaces of idle rollers 42, whereby the article is shifted smoothly from rollers 42 onto the rollers 54 of the chain conveyor. When the chain conveyor 45 is at rest, the rollers 54 function in the same manner as rollers 42, that is, the article to be packaged may be freely pushed forwardly over rollers 54.

Each of chains 46 is entrained over a lower rear idle sprocket 55 mounted on a cross shaft 59, an upper rear idle sprocket 56 mounted on a cross shaft 60, and a driven sprocket 57 mounted on a cross shaft 61 at the upper forward end of the conveyor. Shafts 59 and 60 are journalled in suitable bearings in the vertical frame support 39. Shaft 61 is journalled in opposed horizontally adjustable bearing blocks 75, to be further described below.

Conveyor 45 is intermittently and selectively driven by a motor 62 connected to a speed-reducing gear box 64. The output shaft 65 of gear box 64 carries a sprocket 66 over which there runs a driving chain 67 which is also entrained over a sprocket 69 on shaft 61. A plugging switch 70, forming a part of the control means for motor 62, is driven in timed relationship with shaft 65, and thus the conveyor 45, by means of a further sprocket 71 on shaft 65, a sprocket 72 on the shaft of the plugging switch 70, and a chain 74 drivingly connecting sprockets 71 and 72. The aforementioned bearing blocks 75 are adjustable horizontally on guideways 76 by adjusting screws 77 which are threadedly engaged in cross members 79, connected to the respective intermediate vertical support 40. By suitably adjusting the respective screws 77, the two conveyor chains 46 may be suitably tensioned. After such adjustment of the conveyor chains, driving chain 67 may be suitably tensioned by adjusting motor 62 and gear box 64 longitudinally of the support therefor affixed to the bottom ends of vertical supports 41.

The conveyor 45 has at least one zone thereof at which the article supporting cross bar rollers 54 are spaced from each other more widely than throughout the predominant part of the rest of the conveyor. In the illustrative embodiment, in order to shorten the time lag between flap-folding operations upon successive cartons, there are provided two such zones 80 and 81 which are disposed at intervals of equal length throughout the extent of chains 46. In each such zone 80, 81 there are provided two additional chain links, a "blank" chain link 82 and a special link 84 having inwardly extending ears or brackets 85. An inwardly disposed, flap-folding roller 86 is journalled between the ears 85 of opposed links 84 of the respective chains 46.

An article 11, directed to idle rollers 42, is pushed manually over the supporting rollers 54 of the then idle conveyor 45 in the direction from left to right (FIG. 2) until it is stopped by a stop or abutment means 87 which is then in operative, erected position, as shown in full lines in FIG. 2. The stop 87 is mounted at 93 upon a supporting bracket 90. An air operated cylinder 94 pivotally mounted at its lower end on bracket 90, has a piston rod 95, the upper end of which is pivotally connected to one end of a link 96. The other end of link 96 is pivotally connected to the upper end of bracket 90.

A shorter link 98 is pivotally connected to the outer end of piston rod 95 by pivot pin 83, and is pivotally connected at 88 to bell crank 89 somewhat above but relatively close to pivot pin 93. The bell crank 89 is thus moved upwardly into and maintained in the full line position of FIGS. 2 and 3 when air under pressure is fed to cylinder 94 through the lower port 103' therein and is exhausted through upper port 103, and is moved into its lower, retracted position when air is fed under pressure through the upper port 103 and is exhausted through port 103'. The selective feeding of air under pressure to the opposite ends of cylinder 94 as required, whereby to raise and retract stop 87, is under the control of mechanism which will be particularly described in connection with FIG. 7. To permit stop 87 to be swung as described, two of the conveyor rolls, designated 114', are centrally divided into spaced sections, as shown.

The supporting bracket 90 is pivotally mounted at its lower end on a horizontal pivot pin 91. Bracket 90 is normally urged counterclockwise about pivot pin 91, as it is shown in FIG. 2, by a stiff coil compression "die" spring and pin arrangement shown generally at 92.

A micro-switch 97, mounted in a fixed position on the framework of the machine, is of the normally closed, momentary contact type. The switch is so disposed as to be momentarily closed when the initial, jarring engagement between article 11 and stop 87 causes the bracket 90 to pivot as a whole momentarily to a small extent clockwise about pivot pin 91 and then to return to its initial position. The momentary closing of switch 97 energizes motor 62, thus to drive chain conveyor 45 so that the upper run thereof travels to the right. Such travel of the conveyor, while the carton 10 and contained article 11 remain held from forward motion by the erected stop 87, functions to fold the trailing lower flap under the article in a manner which will be more clearly described in connection with FIGS. 6*a*, 6*b*, and 6*c*.

The apparatus of the invention is provided with a means for sensing or detecting the length of the article to be packaged, and for stopping the conveyor 45 in the proper position to receive a carton 10 which is to be telescoped downwardly over the article.

The apparatus, therefore, is automatically adjusted to process any one of a number of cartons having a length in the direction of its travel lying within an appreciable range of such lengths. An article length-detecting means is provided at each of flap-receiving zones 80, 81 of the conveyor. Each of such detecting means comprises a horizontal switch bar or tripper shaft 111 which extends between the conveyor chains 46 and is journalled by upstanding ears on the chain link 108 which is located immediately in advance of the respective gap 80, 81. Laterally inwardly of one of the chains 46 (the near side in FIG. 2) the tripper shaft 111 is provided with a bell crank having an outer or upper arm 109 and an inner or lower arm 110. The outer ends of such arms carry rollers journalled thereon, as shown. A torsion spring 112 disposed about shaft 111 and acting between the shaft and a chain link 108 constantly urges the shaft 111 and the tripper crank secured thereto into the position in which the lower tripper crank arm, at zone 80, occupies in FIG. 2, that is, with the roller on the outer end of arm 109 lying somewhat outwardly of or above the article supporting surface of rollers 54. If desired, the opposite end of shaft 111, just inwardly of the far chain 46, may be provided with an arm corresponding in size and angular position to arm 109 of the bell crank.

Disposed beneath the upper run of conveyor 45, in position to cooperate with the roller on the end of bell crank arm 110 when there is an article 11 on the conveyor, is an elongated plate 102 which is mounted on the inner ends of arm 101 which, in turn, are secured to a rock shaft 100. Plate 102 is normally urged counterclockwise about the axis of shaft 100 (FIG. 5) into the horizontal position there shown by a compressible re-

silient means 104 disposed about the operating plunger of a switch 99. Switch 99 is closed when its plunger is in the uppermost position, and is open when the plunger is depressed. As shown in FIGS. 4 and 5, the plate 102 is located vertically beneath the path of travel of the roller on the inner arm 110 of the tripper bell crank.

The parts are of such size and configuration, and are so located relative to each other, that when there is no article 11 on the conveyor, the tripper bell crank travels over plate 102 without depressing it and thus without opening switch 99. When, however, there is an article 11 located on conveyor 45, as shown in FIG. 2, and the article is prevented from travel to the right by the erected stop 87, travel of the upper run of conveyor 45 to the right beneath the article causes the roller on arm 109 of the bell crank to rotate the bell crank and shaft 111 counterclockwise (FIG. 2), thereby to cause the roller on arm 110 to contact and depress plate 102 and thus to open switch 99. The opening of switch 99, as will be more fully understood upon consideration of the wiring diagram of FIG. 7, to be discussed hereinafter, causes conveyor 45 to stop in the correct position with either gap 80 or 81, as the case may be, disposed beneath and partially projecting rearwardly beyond the rear edge of article 11, when the latter has been stopped by erected stop 87 as shown in FIG. 2.

The apparatus is provided with further limit switches 105 and 106, mounted on an upper side frame member of the apparatus as shown in FIG. 2. Limit switches 105 may be operated by either arm 109 or arm 110 in its advance motion, and 106 is operated by the lower outer flap 19 of the carton 10, such flap extending outwardly toward the reader in the apparatus shown. Switch 106 is located on the apparatus in a position longitudinally thereof which depends on the length of the longest carton or case being handled in any specific installation of the apparatus. Limit switches 105 and 106 are normally open. They are momentarily closed at the proper points in the operating cycle to retract the stop 87 and to raise such stop into erected position, respectively, in a manner to be described.

The Controls for the Apparatus

Turning now to FIG. 7, it will be seen that motor 62 which drives conveyor 45 is of the 3-phase type. Motor 62 is under the control of a starting and reversing switch, generally designated 340. Such switch may, for example, be one sold under the designation Allen Bradley, Bulletin No. 705, size "O." Such switch is of the full voltage type, having 110 volt coils and N 10 heaters. The system is supplied with three phase, 440 volt, 60 cycle alternating current through leads L_1, L_2 and L_3. In FIG. 7 all wires carrying 440 volts are shown in heavy lines, and those carrying 110 volts are shown in lighter lines. The control coils of the switch 340 are supplied with 110 volt current from a transformer 345, the 440 volt primary 344 of which is supplied by leads 341 and 342 from wires L_1 and L_2, respectively. The 110 volt secondary 346 of the transformer supplies current to the control coils of switch 340 and to the limit and other switches for such coils through secondary lead wires 347, 349. A further lead wire 350 extending to the operating coils of switch 340, is selectively connected to wire 347 by switches 97, 128, 99 and 107. It will be understood that when the circuit between wires 347 and 350 is completed by one or more of such switches the operating coil of the switch 340 will be energized to close the main contacts of the switch and to energize motor 62 to cause it to run in the forward direction; when wires 347 and 350 are entirely disconnected, the main "forward" contacts of switch 340 are open, and motor 62 is at rest.

In the switch 340 the forward and reverse coils are designated "For" and "Rev," respectively. The elements marked T_1 and T_3 are heaters, and elements *a* and *b* are the overloads for the heaters T_1 and T_3. The parts marked *c* and *d* are interlocks. The interlock marked *c* is closed when the forward side of the switch is open, thereby insuring that the forward circuit is open when the reversing circuit is energized.

The apparatus includes a four-way solenoid valve 118 which is selectively energized so that the operating plunger 123, thereof moves in opposite directions through the above described limit switches 105, 106. Switch 105, which is normally open, when closed energizes solenoid 118 through wire 347, switch 105, and wire 349, so as to retract stop 87. Switch 106, which is also of the normally open type, when closed functions to energize solenoid valve 118 through wire 347, switch 106, and wire 349 so as to raise stop 87 into its operative position. The plugging switch 70 is closed only when the conveyor chain 45 occupies either of its two "at rest" positions. In these positions switch 70 in effect bridges switch 107 when switch 107 is opened to stop motor 62; the circuit is thus placed in readiness to be started for a new cycle by the momentary closing of the manually operating switch 97.

Operation of the Apparatus

An article 11 mounted on a skid 15 is delivered by a prior conveyor (not shown) to the rollers 42 at the entering end of conveyor 45. The conveyor 45 is then in its idle or stopped condition, and the stop 87 is in erected position. The article 11 is pushed manually along the freely rotatable rollers 54 on the top run of the idle conveyor 45 until it engages stop 87 with sufficient impact to cause element 90 to turn slightly about pivot 91, and thus to close switch 97. The closing of such switch starts motor 62, which drives conveyor 45 with the upper run thereof travelling to the right until an article length-detecting means 109, 110, 111, etc. at the nearer one of zones 80, 81 opens switch 99 to stop motor 62 and thus to halt the conveyor in the correct position. The opening of switch 99 also energizes air motor 94 to retract stop 87 into the dotted line position shown in FIG. 2.

A carton 10, with its bottom flaps disposed as shown in FIG. 1, is now telescoped downwardly over the article 11. As shown in FIG. 2, the trailing bottom flap 17 extends downwardly through gap 81 of the conveyor and immediately forward of roller 86 thereon. The leading bottom flap 16 extends vertically down between the main side frame members of section 26 and forwardly of sprockets 57 which define the forward end of conveyor 45.

Conveyor 45 is now started by manually operated switch 128 (FIG. 7) again to run in the forward direction. Simultaneously the stop 87 is again erected into operative position, this time, of course, engaging the bottom forward end of carton 10. The article 11 and carton 10 are thus prevented from travel to the right. Consequently, at this time, nothing happens to the leading depending flap 16. The travel of conveyor 45, however, causes the trailing depending flap 17 to be progressively folded upwardly under the skid 15 of article 11. The manner of such folding of flap 17 will be more fully understood upon consideration of FIGS. 6*a*, 6*b*, and 6*c*.

In FIG. 6*a* the parts are shown in the positions which they occupy immediately after the carton 10 has been telescoped over article 11, stop 87 has been erected, and conveyor 45 has been started. The article is supported on the freely rotatable rollers 54 as the upper run of the conveyor 45 travels to the right. As the conveyor thus travels, the inwardly projecting or lower roller 86 thereon progressively folds flap 17 in a direction from adjacent from its root toward its free edge, in the manner shown in FIG. 6*b*. Such folding of the flap is aided by the load-bearing rollers on the conveyor which lie to the rear of gap 81, the first of such subsequent rollers, here designated 54', causing the flap 17 to be folded tightly against the bottom of skid 15. Roller 54' and the subsequent rollers 54 then support the article through the interposed portion of flap 17. The width of gap 81 and the distance between roller 54' and the last load-bearing roller in

advance of gap **81**, here designated **54²**, are such that during the folding upwardly of flap **17**, it undergoes very little if any bending throughout its length.

Upon the completion of the upward folding of flap **17**, limit switch **105** is momentarily closed by arm **110**, whereby to retract stop **87**, as shown in FIG. 6*c*. The continued operation of conveyor **45** then causes the container **10** with its contained article **11** to be delivered to the right over idle entering rollers **113**, **113'**, **114'**, and **114** of the subsequent conveyor. Such travel of the container causes the leading flap **16** to be folded upwardly beneath the skids **15** of the article by the rollers **114'**. The distance between roller **113'** and the next forward roller **114'** is such that during such folding upwardly of flap **16** the flap undergoes little if any bending throughout its length. The driving of conveyor **45** continues until the operating arm of stop switch **107**, mounted on vertical support **40**, has been contacted and operated by the roller on arm **109** of the tripper mechanism which then lies in the bottom run of the conveyor chain.

In the latter part of the forward travel of the packaged article on conveyor **45**, in the apparatus shown, the forward edge of the carton **10** may contact the operating arm of a switch (not shown) in the circuit of a motor (not shown) which drives one or more of the terminal rolls **114'** and **114** and the rolls of a subsequent conveyor (not shown).

As above indicated, the apparatus of the present invention may, if desired, feed directly into subsequent packaging apparatus such as that of the aforementioned Rodman application. In such combination there is employed a short driven conveyor, of which rolls **114'** and **114** are a part, such conveyor having sufficient length to support one or two of the largest containers or cartons which the apparatus is called upon to process.

Although only one embodiment of the apparatus and method of the invention has been illustrated in the accompanying drawings and described in the foregoing specification, it is to be especially understood that various changes, such as in the relative dimensions of the parts, materials used, and the like, as well as the suggested manner of use of the apparatus and method of the invention, may be made therein without departing from the spirit and scope of the invention as will now be apparent to those skilled in the art.

What is claimed is:

1. Apparatus for packaging a large heavy article within a carton having a flap hinged to the bottom of a side panel thereof, which comprises

means for supporting the article from below, the supporting means having an opening extending transversely of the supporting means to receive the flap therethrough when the carton is telescoped downwardly over the article with the flap in generally vertically depending position,

flap engaging means on the supporting means bordering the opening therethrough,

abutment means adapted to engage the side of the carton opposite that from which the flap depends,

means for initially positioning the parts so that when the article contacts the abutment means, prior to assembly of the carton over the article, the opening in the supporting means is positioned adjacent that edge of the article adjacent which the root of the flap is to be positioned so as to receive said flap,

said positioning means comprising an article length sensing means on the supporting means which interacts with the rear edge of the article after the article is first stopped by the abutment,

and means to move the carton, the contained article, and the abutment means relative to the support and the flap engaging means thereon in such direction as to fold the flap under the article progressively from the root to the tip of the flap.

2. Apparatus as defined in claim 1, wherein the abutment means is selectively retractable from an article on the support, whereby, with the abutment means in operative position, the article may be initially located on the support with respect to the opening therein, the abutment means may be retracted to permit telescoping of the carton over the article, the abutment means thereafter being advanceable to engage the carton during relative travel of the supporting means, with its flap engaging means, as one group, and the abutment, article, and carton, as another group, with respect to each other.

3. Apparatus as defined in claim 1, wherein the abutment means when in operative position is essentially fixed, and the active portion of the supporting means moves in generally a straight line toward the abutment means.

4. Apparatus as defined in claim 1, wherein the supporting means is an endless driven conveyor having upper and lower runs, and comprising means for driving the conveyor, and means for stopping the conveyor, said conveyor stopping means being operable by said length sensing means to position the opening in the conveyor.

5. Apparatus for packaging a large heavy article within a carton having a pair of oppositely disposed flaps hinged to the bottom of leading and trailing panels thereof, which comprises

a continuous conveyor for initially supporting the article from below,

the conveyor having an opening extending transversely of the conveyor to receive the trailing flap therethrough,

flap engaging means on the conveyor bordering the trailing edge of said opening,

abutment means selectively engageable with the leading side of the article and of the carton,

means for initially positioning the conveyor so that a carton may be vertically telescoped over an article on the conveyor which has been stopped by the abutment means with the trailing flap extending through the opening in the conveyor and the leading flap lying forwardly beyond the forward end of the conveyor comprising,

article length sensing means on the conveyor and interacting with the rear edge of the article as the conveyor moves beneath the article when the latter is first stopped by the abutment,

and means to drive the conveyor toward the abutment, whereby the abutment maintains the carton and its contained article from travel with the conveyor and the flap engaging means on the conveyor progressively folds the trailing flap up into position under the article.

6. Apparatus as defined in claim 5, comprising antifriction article-supporting means on the conveyor, whereby the article may move freely in a forward direction over the conveyor with the conveyor at rest, and the conveyor may move freely under the article when the latter is held from movement by the abutment means.

7. Apparatus as defined in claim 5, comprising a second conveyor for subsequently receiving the article from the first mentioned conveyor and supporting it from below, said second conveyor including means which engages and folds the leading flap up under the article upon subsequent movement of the article and carton forwardly over the second conveyor.

8. Apparatus as defined in claim 7, said apparatus having control mechanism comprising means to start the conveyor after the conveyor has been stopped by the article length sensing means, means automatically to retract the abutment upon completion of the folding of the bottom trailing flap, and means to stop the conveyor after the packaged article has been forwarded thereby a sufficient distance substantially to complete the folding of the forward bottom flap.

9. The method of packaging a large heavy article within a carton having a flap on the bottom thereof, which comprises supporting the article from below at a plurality

of spaced points, restraining the article from travel in a forward direction, moving the points of support in said forward direction, detecting the trailing edge of said article, and stopping said points of support so that no point of support will be adjacent said trailing edge, telescoping the carton in open bottomed condition over the article with the flap depending from the carton body while the latter is thus supported, restraining the article and carton from travel in the direction away from said flap, progressively moving the points of support of the article in substantially their initial spaced relationship in said direction while progressively folding said flap from its root outwardly upward into horizontal position beneath the article, and progressively supporting the article and carton at spaced points through the folded flap as the folding thereof progresses.

10. The method of packaging a large heavy article within a carton having two opposed flaps on the bottom thereof, which comprises supporting the article from below at a plurality of spaced points, restraining the article from travel in a forward direction, moving the points of support in said forward direction, detecting the trailing edge of said article, and stopping said points of support so that no point of support will be adjacent said trailing edge, telescoping the carton in open bottomed condition over the article with the opposed flaps depending from the carton body while the latter is thus supported, restraining the article and carton from travel in the direction away from a first, trailing one of said flaps, progressively moving the points of support of the article in substantially their initial spaced relationship in said direction while progressively folding said first flap from its root outwardly upward into horizontal position beneath the article, progressively supporting at least a portion of the article and carton at spaced points through the folded first flap as the folding thereof progresses, and thereafter releasing the restraint of the carton and its contained article and causing it to travel in a forward direction while progressively folding the second, leading flap from its root outwardly upward into horizontal position beneath the article, and progressively supporting at least a portion of the article and carton at spaced points through the folded second flap as the folding thereof progresses.

11. The apparatus of claim 4, wherein said length sensing means is mounted on said conveyor adjacent the forward end of said opening.

12. The apparatus of claim 11, wherein the said length sensing means comprises a bell crank having a first arm biased outwardly of the plane of said conveyor and which may be moved into the plane of said conveyor by the article,

and a second arm fixedly mounted to said first arm, and which is normally out of contact with said conveyor stopping means and which is moved into contact with said conveyor stopping means when said first arm is moved into the plane of the conveyor.

13. Apparatus for packaging a large heavy article within a carton having a pair of oppositely disposed flaps hinged to the bottom of the leading and trailing panels thereof, which comprises

a continuous conveyor for initially supporting the article from below,

the conveyor having an opening extending transversely of the conveyor to receive the trailing flap therethrough,

flap engaging means on the conveyor bordering the trailing edge of said opening,

abutment means selectively engageable with the leading side of the article and of the carton,

means to drive said conveyor toward said abutment means,

means for initially positioning the conveyor so that a carton may be vertically telescoped over an article on the conveyor which has been stopped by the abutment means with the trailing flap extending through the opening in the conveyor and the leading flap lying forwardly beyond the forward end of the conveyor comprising,

means for starting said conveyor driving means operable by said abutment means whereby said conveyor moves toward said abutment means when an article strikes said abutment means,

article length sensing means on the conveyor and interacting with the rear edge of the article as the conveyor moves beneath the article when the latter is first stopped by the abutment,

means for stopping said conveyor driving means operable by said article length sensing means whereby said opening will be positioned beneath said article trailing edge,

second means for operating said conveyor driving means whereby the abutment maintains the carton and its contained article from travel with the conveyor and the flap engaging means on the conveyor progressively folds the trailing flap up into position under the article.

14. Apparatus as defined in claim 13, comprising a second conveyor for subsequently receiving the article from the first mentioned conveyor and supporting it from below, said second conveyor including means which engages and folds the leading flap up under the article upon subsequent movement of the article and carton forwardly over the second conveyor.

References Cited in the file of this patent

UNITED STATES PATENTS

2,804,738	Shenigo	Sept. 3, 1957
2,891,367	Shenigo	July 23, 1959
2,939,260	Ogle et al.	June 7, 1960
2,969,630	Shenigo	Jan. 31, 1961