Nov. 16, 1954 C. J. MALHIOT 2,694,350

PACKAGING MACHINE

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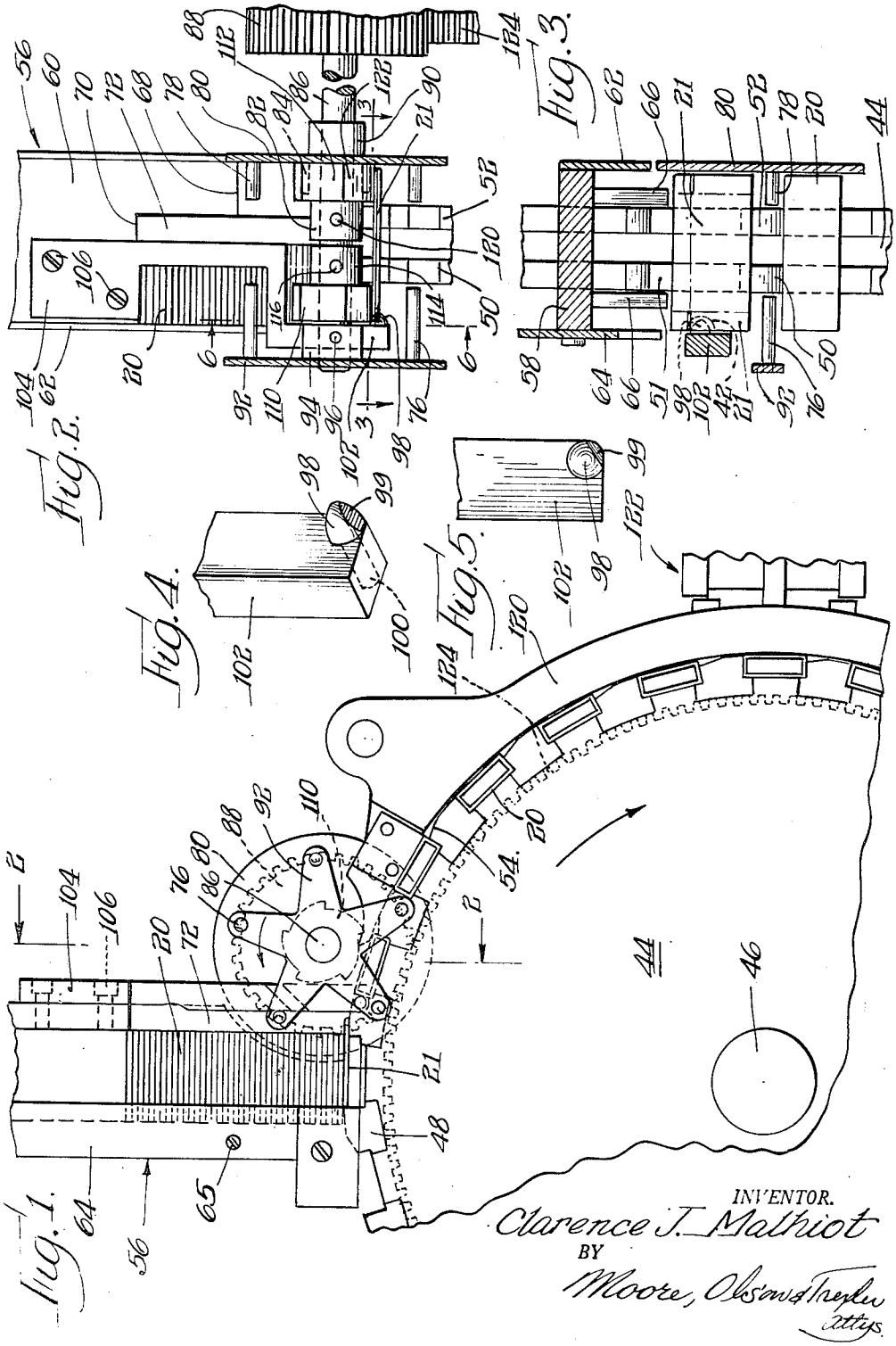


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

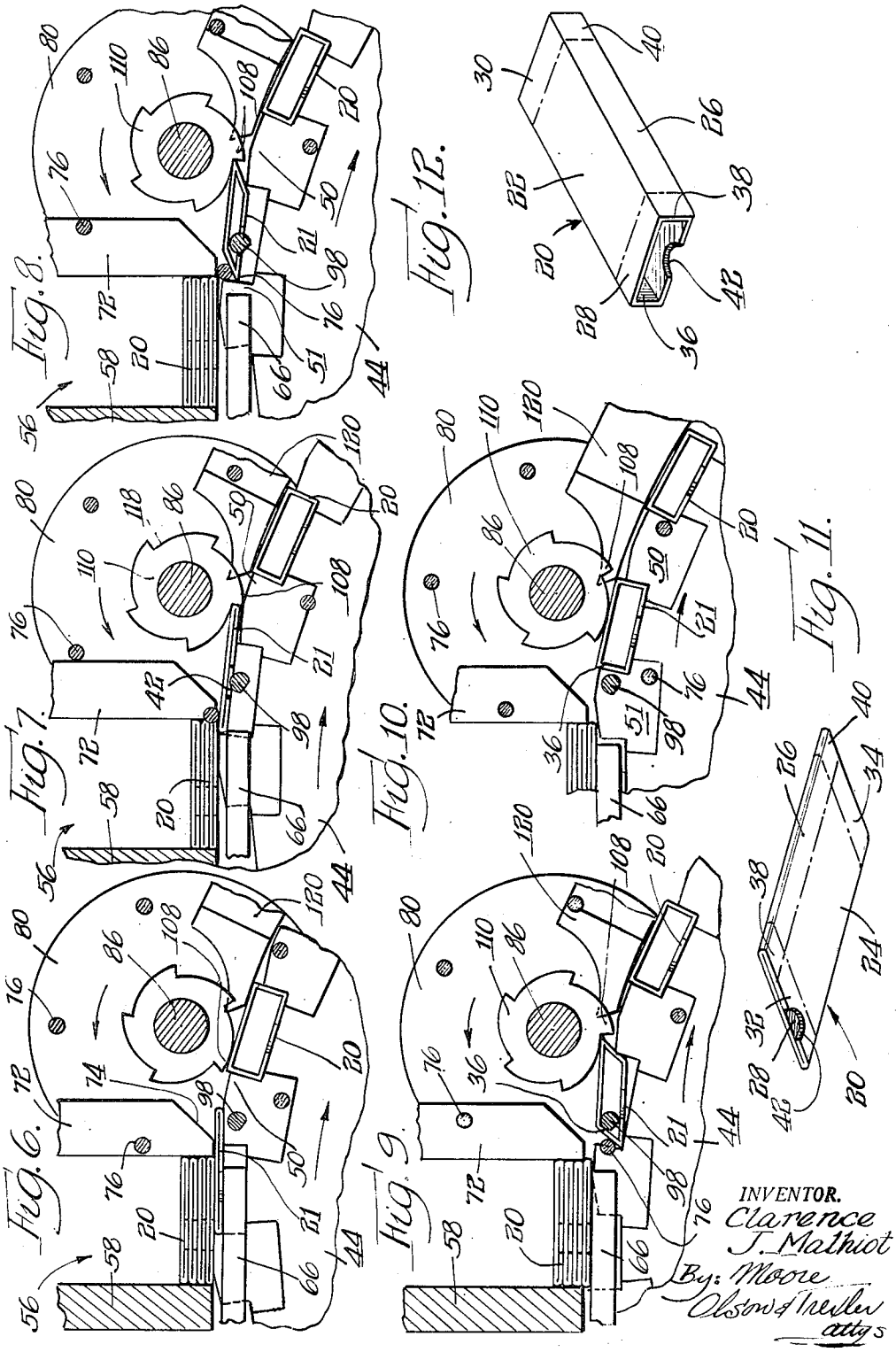
Fig. 5.

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2,694,350

PACKAGING MACHINE

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8 Claims. (Cl. 93—53)

This invention relates to packaging machines, and more particularly to apparatus for opening collapsed cartons.

In packaging machines of the type in which collapsed cartons are opened to receive articles to be packaged therein, the carton opener or expander must be capable of opening the collapsed cartons rapidly, that is, a large number of cartons must be opened per unit of time. In addition to opening the cartons at a high rate, the opener must be dependable whereby to insure that each carton will be opened and properly positioned and retained in the proper position for the succeeding filling and sealing operations. This feature is important to insure uninterrupted operation of the machine and to prevent possible damage to the working parts of the packaging machine.

The present invention contemplates a carton opener in which substantially all of the movable components of the opening apparatus are rotary whereby to give rapid and dependable opening of the collapsed cartons.

Accordingly it is an object of the invention to provide an improved apparatus for opening collapsed cartons; more specifically it is an object of the invention to provide improved apparatus which will open collapsed cartons at a high rate.

Another object of the invention is to provide apparatus for opening collapsed cartons wherein substantially all of the component parts are rotary whereby to reduce inertia and provide more rapid operation.

Still another object of the invention is to provide improved apparatus of the type described for opening cartons, which apparatus gives more dependable and smooth operation.

Yet another object of the invention is to provide carton opening apparatus having rotary operating parts in which the apparatus has a longer useful life, is adjusted with facility to accommodate various types of cartons, and wherein less maintenance is required.

These and other objects and advantages of the invention will be understood from the following specification when taken in connection with the accompanying drawings.

In the drawings, wherein like reference numerals have been used to indicate like parts throughout:

Fig. 1 is a partial view in side elevation showing apparatus for opening collapsed cartons made in accordance with and embodying the principles of the present invention;

Fig. 2 is a view in vertical section substantially as seen in the direction of the arrows along the line 2—2 of Fig. 1;

Fig. 3 is a view in horizontal section substantially as seen in the direction of the arrows along the line 3—3 of Fig. 2;

Fig. 4 is a partial enlarged perspective view of the stationary expander pin and its supporting arm;

Fig. 5 is a front elevation view of the stationary expander pin and its associated arm shown in Fig. 4;

Fig. 6 is a view in vertical section as seen in the direction of the arrows along the line 6—6 of Fig. 2;

Figs. 7, 8, 9 and 10 are views similar to Fig. 6 and illustrating the positions of the various parts of the opening machine at successive stages during the opening of a collapsed carton;

Fig. 11 is a perspective view of a collapsed carton which can be opened using the machine of the present invention; and

Fig. 12 is a perspective view of the carton shown in Fig. 11 in the open or expanded position.

There is shown in Patent No. 1,486,598, issued to M. J. Milmoe on March 11, 1924, a complete cartoning machine including apparatus for opening collapsed cartons, filling apparatus, and closing and sealing apparatus. In the apparatus shown in this patent, the collapsed cartons are removed from a magazine 2 by teeth 7 positioned on a conveying wheel 4. A stationary pin 46 and a pair of reciprocating elements 49 and 23 cooperate to open the carton as it is moved into pockets formed between the teeth 7 on the wheel 4. The inertia of the reciprocating members 23 and 49 definitely limit the rate at which the cartons can be opened.

The present invention substitutes rotary parts for the reciprocating parts in the Milmoe patent. The carton opening apparatus of the present invention is adapted to be incorporated into the cartoning machine shown in the Milmoe patent and accordingly the Milmoe patent can be referred to for a description of the parts which are omitted from the present specification and drawings. The arrangement of parts and the operation thereof of the present invention are substantially the same as those of the above Milmoe patent, the main difference being a substitution of rotary parts in the carton opening mechanism for the reciprocating parts 23 and 49 in the Milmoe patent.

There is shown in Figs. 11 and 12 a carton, generally designated by the numeral 20, which can be opened or expanded using the apparatus of the present invention preparatory to filling, closing and sealing the carton. The carton 20 is substantially tubular in shape and expanded and comprises a top wall 22, a bottom wall 24, and a pair of side walls 26 (only one side wall 26 being illustrated). The ends of the top wall 22 are provided with end flaps 28 and 30, the bottom wall provided with flaps 32 and 34, and the side walls 26 are provided with end flaps 36, 38, and 40, one end flap not being shown in the drawings. There is formed in flaps 32 a substantially semi-circular cut-out 42 which serves a purpose to be more fully set forth hereinafter.

Referring now to Figs. 1, 2 and 3, the apparatus for opening or expanding the carton 20 will be described in detail. The carton opening apparatus includes a carrier wheel 44 which is mounted upon a shaft 46. The shaft 46 is rotatably mounted and is driven by any suitable prime mover (not shown). Carrier wheel 44 is rotated clockwise in the direction of the arrow, as seen in Figs. 1 and 6 through 10 inclusive. The periphery of the carrier wheel 44 has a plurality of slots formed therein, 24 having been shown for purposes of illustration. Positioned in each slot is a carrier block 48, each block being provided with a pair of laterally spaced teeth 50 and 52, see Figs. 2 and 3. The trailing edges of the teeth 50 and 52 are preferably beveled or cut away as at 54 for a purpose which will be more fully explained later.

The collapsed cartons 20 are fed to the carrier wheel 44 from a magazine generally designated by the numeral 56. Magazine 56 includes a rear wall 58, a forward wall 60, and a side wall 62 joining the front and rear walls. The width of walls 58 and 60 is slightly greater than the length of a collapsed carton 20 whereby to accommodate and support these cartons in stacked relationship. Means is provided for retaining the cartons within the magazine 56 in the form of a side bar 64 which is attached to the rear wall 58 by any suitable means such as screws 65. The lower end of the magazine 56 is closed by a pair of strips 66 which are positioned to support spaced apart portions of the associated carton in magazine 56. The distance between the inner edges of the strips 66 is slightly greater than the width of blocks 48 and the upper edges of the strips 66 are so positioned that the forward edges of the teeth 50 and 52 contact and engage the rear edge of the carton lying upon strips 66.

As is best shown in Fig. 2, the front wall 60 terminates at a point spaced from the carrier wheel 44 as at 68 and is further recessed along the line 70. Attached to the forward wall 60 is a downwardly extending arm 72 which terminates a short distance above strips 66, the distance between strips 66 and the end of arm 72 being equal to the thickness of collapsed carton 20.

The lowermost end of arm 72 is cut away at 74, as can be seen in Fig. 6. It will be seen that arm 72 serves to hold the lowermost cartons in position within the maga-

zine 56 with the exception of the lowermost carton which can be removed by engagement with the teeth 50–52.

The manner in which the lowermost carton, hereinafter designated carton 21, is removed from the magazine 56 is best illustrated in Fig. 6. The magazine is mounted on a stationary portion of the packaging machine and the carrier wheel 44 and its associated teeth are rotated in a clockwise direction as viewed in Fig. 6. As wheel 44 rotates, one of its teeth, designated 51 in the drawings, moves into position to engage the left hand edge of the carton 21. It will be noted from Fig. 6 that this edge of carton 21 is disposed below the lowermost end of the rear wall 58 and that the upper edge of tooth 51 passes just below wall 58. As rotation of wheel 44 is continued, tooth 51 pushes carton 21 out through the opening under arm 72, the right hand edge of carton 21 being received on the beveled surface of the tooth 50 which is positioned clockwise with respect to tooth 51. When the left hand edge of carton 21 passes beyond the right hand edges of strips 66, this end tends to drop into the recess formed between teeth 50 and 51, see Fig. 7.

It is desirable that the left hand edge of the carton 21 drop to the notch and therefore means is provided to insure that this edge of the carton is so positioned. This positioning means is best illustrated in Figs. 1 and 2 and comprises a set of front expander pins 76 and an opposed set of back expander pins 78. Pins 78 are mounted on a substantially circular flange 80 by any suitable means such as riveting. Flange 80 in turn is fixedly secured to a hub 82 by means of a plurality of screws 84. Means is provided for rotating hub 82 in the form of a shaft 86 driven by a gear 88. The manner of driving gear 88 and the speed of driving gear 88 will be more fully explained hereinafter. The shaft 86 is rotatably journaled in a bearing 90.

The front expander pins 76 are fixedly attached as by riveting to a front flange 92 which is substantially star shaped, as seen in Fig. 1. Extending from the same side of flange 92 as the pins 76 is an integrally attached hub 94 having an aperture therein to receive shaft 86. Hub 94 is secured against rotation with respect to shaft 86 by means of a set screw 96.

Pins 76 and 78 extend substantially perpendicularly with respect to their associated flanges 92 and 80 respectively and are always positioned substantially parallel to the axis of shaft 86. Five pins have been shown for purposes of illustration on each flange. It is to be understood, however, that a greater or lesser number of pins can be used if desirable. The pins 76 and 78 are directed inwardly toward each other, the inner ends of the pins being spaced apart a distance slightly greater than the width of the blocks 48. Accordingly the ends of the pins will engage a substantial portion of the cartons 21 which are to be pushed into their associated recesses.

Referring again to Fig. 7, it will be seen that the path of travel of the pins and the rotation of shafts 46 and 86 are so arranged that a pin engages the rear edge of carton 21 as this rear edge emerges from magazine 56. The pins and associated parts are rotated in a counter-clockwise direction, as indicated by the arrows, and therefore the pins push this edge of carton 21 into its associated recess. By the time the pins have pushed the rear edge of carton 21 to the lowermost portion of the recess, the carton has moved to a position such that the pins no longer contact the carton whereby to permit the pins to continue in their paths of rotation without deforming or injuring the carton 21. In addition to pushing the rear end of the cartons into their associated recessses, the pins 76 and 78 are so arranged that they contact the last few cartons remaining in magazine 56 through the openings in wall 60 to push these cartons in a downward direction. This action insures that a carton is in position on strips 66 when the next tooth on wheel 44 is in position to receive a carton thereagainst.

The opening or expanding of the carton 21 is begun by a stationary expander pin 98 as the pins 76 and 78 push the rear end of carton 21 into the recess. As is best illustrated in Fig. 4, the head of pin 98 is substantially conoidal in shape and terminates at a point which is directed inwardly toward the carton 21. The under side of pin 98 is recessed as at 99 to provide an entering edge to aid in initiating the opening operation. A shank 100 integrally attached to pin 98 attaches the pin to an arm 102 of a bracket 104. The upper end of bracket 104 is attached as by screws 106 to the front wall 60 of the magazine 56 for stationary support. The remaining portion of the bracket 104 is substantially L-shaped, arm 102 extending substantially parallel to the plane of wheel 44 and spaced therefrom. Bracket 104 positions pin 98 so that it engages carton 21 at a predetermined point.

Referring more particularly to Fig. 7, the engagement of pin 98 with carton 21 can be illustrated. Pin 98 is so positioned that it is aligned with the cut-out 42 in flap 32 when the rear edge of carton 21 is about to be dropped into the associated recess. As carton 21 drops into the recess, pin 98 comes into contact with the lower surface of flap 28 and in effect urges this flap and its connected parts to an open position since the carton is moving downwardly and to the right with respect to pin 98. As rotation of wheel 44 continues, the rotating pins 76 and 78 push the carton 21 deeper into the recess. This moves carton 21 downwardly with respect to pin 98 and thereby continues the initial opening of the carton as illustrated in Fig. 8.

When the carton 21 is in the position shown in Fig. 7 of the drawings, its right hand edge contacts a tooth 108 formed on an expander cam 110. It is expander cam 110 and its companion cam 112 which complete the opening of carton 21. Expander cam 110 is provided with a hub 114 which serves to connect cam 110 to shaft 86 for rotation therewith. A set screw 116 positively affixes cam 110 on shaft 86. A plurality of teeth 108 are formed on the surface of cam 110, five being shown for purposes of illustration. A greater or lesser number of teeth 108 can be used if desired. The base of each tooth is connected by a curved surface 118 with the top of the next tooth.

The cam 112 is carried by hub 82 described above, a set screw 120 serving to interconnect hub 82 and shaft 86. The surface of cam 112 is provided with five teeth 122, teeth 122 being constructed and shaped substantially the same as teeth 108 on cam 110.

From the above description it will be seen that both sets of rotating expander pins 76 and 78 and both expander cams 110 and 112 are mounted upon and driven by shaft 86. The gear 88 driving shaft 86 is driven by a gear 124 at such a speed that the shaft 86 makes 24 revolutions for each five revolutions of carrier wheel 44. Since therefore 24 sets of teeth are recessed on wheel 44 and five sets of pins and expander teeth are attached to shaft 86, each carton in a recess on wheel 44 will be provided with rotating expander pins and teeth on rotating expander cams.

Referring now to Figs. 8, 9 and 10, the manner in which the expander cams 110 and 112 operate to complete the opening of carton 21 will be described. When the right hand edge of carton 21 contacts a tooth 108 on cam 110, the carton and the tooth are traveling in the same direction, namely, to the right as viewed in these figures. However, the diameters of the cam 110 and the wheel 44 and the rate or rotation of these members is such that the carton 21 is carried to the right more rapidly than tooth 108 rotates to the right. Accordingly, the carton 21 will have pressure exerted thereon in a direction to open or expand the carton, as shown in Fig. 9. The stationary pin 98 in addition to initiating the opening operation also aids in this final stage of opening by cooperating with the rotating pin 76 to move flap 36 to a position substantially perpendicular to flap 32.

After wheel 44 has rotated a short distance clockwise from the position shown in Fig. 9, the flap 36 will have moved to a position such that pin 76 can rotate past and pin 98 will begin urging flap 36 outwardly. By the time the wheel 44 has rotated to the position illustrated in Fig. 10, the pin 98 has been removed from contact with carton 21 by pushing flap 36 outwardly a sufficient distance to allow pin 98 to pass beyond the flap.

By referring to Fig. 2 it will be seen that cam 112 is rotated on shaft 86 a few degrees clockwise, as viewed in Fig. 1, so that the teeth 198 of cam 110 contact the carton before the teeth 122 of cam 112. By this construction the carton is progressively opened beginning on the left, as viewed in Figs. 2 and 3. This method of operation facilitates opening the carton and in addition prevents buckling or other deformation of the carton during the opening thereof. If opening were started simultaneously at both ends of the carton along the upper wall, it has been found that it frequently would happen that as both ends of the upper wall started to bend in an upper direction, the central portion of the upper wall

would bend downwardly. When the two opening movements meet each other at the center of the carton, a transverse buckling of the upper wall in the carton occurs, this buckling tending to break the wall, deforming the carton and preventing completion of the opening operation. When opening is started at one end as occurs by offsetting the teeth of cams **110** and **112**, the upper wall begins to move upwardly at one end only and the curve in the wall moves smoothly and progressively toward the other end by which time the cam **112** contacts the adjacent edge of the carton. This operation assures that the carton is always brought into its correct rectangular formation and without injury to the carton.

In addition to completing the opening of carton **21**, the cams **110** and **112** push the opened carton firmly into the recess by means of the curved surface **118** contacting the upper side **22** of the carton. After the carton has been firmly seated in its associated recess, the upper side **22** passes under and is engaged by a holding member **120** positioned adjacent the wheel **44**. The surface of member **120** facing wheel **44** is arcuately shaped and has a diameter such that the opened cartons **20** are in contact therewith as they are carried by the wheel **44** to the next processing station. The guide member **120** extends circumferentially around wheel **44** to the next processing station generally designated by the numeral 122 in Fig. 1.

A complete cycle of operation for the carton opener of the present invention is as follows: A plurality of collapsed cartons **20** are properly positioned in the magazine **56** with the lowermost carton resting against the strips **66**. Rotation of shafts **46** and **86** is begun through gears **88** and **124** whereby to rotate shaft **46** five revolutions for each twenty-four revolutions of shaft **86**. Shaft **86** and its associated wheel **44** are rotated clockwise, as viewed in Fig. 1, and shaft **86** and its associated parts are rotated counter-clockwise, as viewed in this figure.

The forward edge of a tooth such as tooth **51** initially contacts the rear edge of the collapsed carton **21** which lies against strips **66**. Further rotation of wheel **44** pushes carton **21** out of magazine **56** under arm **72**, the forward edge of carton **21** lying upon the beveled surface of the tooth **50** disposed clockwise with respect to tooth **51**. In this manner carton **21** is removed from the magazine **56** and a new carton assumes the position just vacated by carton **21**.

As the carton **21** leaves magazine **56** the forward edge thereof abuts the tooth **108** of cam **110** and pins **76** and **78** contact the rear edge of carton **21**, see Fig. 7. Pins **76** and **78** are rotating counter-clockwise, as viewed in Fig. 7, and therefore urge the carton **21** downwardly into the recess between the teeth **50** and **51**.

Stationary pin **98** is simultaneously initiating the opening of carton **21** by passing through cut-out **42** and engaging the lower surface of flap **28**. The initial opening of the carton is illustrated in Fig. 8.

The peripheral speed of the teeth **50** and **51** is greater than the speed of teeth **108** and therefore the carton is in effect compressed between tooth **108** on cam **110** and tooth **51** on wheel **44**, although both the cam and the wheel are moving in the same direction at this point. The compression of this end of carton **21** moves smoothly toward the other end until the teeth **122** on cam **112** contact this edge on the carton. It will be seen that at this stage there are several forces tending to open the carton, all of these forces cooperating to insure that the carton is opened without damage thereto.

When the apparatus reaches the condition shown in Fig. 9 the rear end of the carton is practically seated in its associated recess and the pins **76** and **78** are nearly out of contact therewith due to the fact that the periphery of wheel **44** is moving faster than the pin **76**. Stationary pin **98** is now engaging the flap **36** preparatory to pushing this flap back to allow the pin **98** to move from within the center of the opened carton. The forward edge of the carton is still being pushed toward the rear edge by means of tooth **108** and the curved surface **118** on the cams are pushing the forward edge of the carton into the recess.

The final step in the opening operation is illustrated in Fig. 10. The pin **76** has moved completely out of contact with carton **21**. Stationary pin **98** has forced its way from within the carton through the swinging flap **36** and the carton is nearly seated within its associated recess and is being urged therein by the next tooth on the cams **110** and **112**. As wheel **44** rotates farther the front edge of the open carton passes under the guide member **120** and thereafter guide member **120** holds the carton in opened position within the recess between the teeth on wheel **44** while the carton is being conveyed to the next processing station.

From the above description it will be seen that all the parts which act upon the collapsed carton to effect the opening thereof, that is, the cams **110** and **112** and the pins **76** and **78** are rotatably mounted. This rotary mounting of the opening members permits rapid operation of these members so that high production is possible. With all of the parts rotatably mounted there is no problem of inertia as is the case with reciprocating parts of the type shown in the above identified Milmoe patent. Rotary operating parts also give much smoother operation and possess longer life and require less maintenance. Adjustment of the pins **76** and **78** and the cams **110** and **112** is very simple and is accomplished by rotating these parts with respect to shaft **86**. This structure permits ready adjustment of the opener members to accommodate various types of cartons to be opened.

Although a preferred embodiment of the invention has been shown for purposes of illustration, it is to be understood that various modifications and changes can be made therein without departing from the spirit and scope of the invention. Accordingly the invention is to be limited only as set forth in the following claims.

The invention is hereby claimed as follows:

1. An apparatus for opening collapsed cartons comprising a magazine for holding a plurality of collapsed cartons, said magazine having an opening therein to permit said cartons to be removed one at a time therefrom, a carrier having recesses therein for extracting said cartons from said magazine, and a rotatably mounted pin movable past the opening in said magazine to engage the trailing edge of a carton moving it toward said carrier to seat the trailing edge of the carton extracted from said magaizne in a recess.

2. An apparatus for opening collapsed cartons comprising a magazine for holding a plurality of collapsed cartons, said magazine having an opening therein to permit said cartons to be removed one at a time therefrom, a carrier having recesses therein for extracting said cartons from said magazine, and a rotatably mounted pin movable past the opening in said magazine for seating the edge of a carton extracted from said magazine in a recess and for readjusting the remaining cartons in said magazine.

3. An apparatus for opening collapsed cartons comprising a magazine for holding a plurality of collapsed cartons, a carrier having teeth forming recesses thereon, means for moving said carrier to cause the front edges of a tooth thereon to engage the rear edge of a carton and extract said carton from said magazine, rotary means for engaging and moving the rear edge of said carton into the corner of the recess adjacent said tooth, and rotary cam means for engaging the opposite edge of said carton and compressing said carton against said tooth to open said carton in said recess.

4. An apparatus for opening collapsed cartons comprising a magazine for holding a plurality of collapsed cartons, a carrier having teeth thereon forming recesses, means for moving said carrier to cause the front edge of one of said teeth to engage the rear edge of a carton and extract the carton from said magazine, rotating pin means for moving the rear edge of the extracted carton into the rear corner of the recess in the front of said tooth while the front edge of said carton rests upon the rear edge of the preceding tooth, and rotary cam means for engaging the front edge of said carton to compress said carton against the rear corner of said recess to open said carton and seat said carton in said recess.

5. An apparatus for opening collapsed cartons comprising a carrier having means thereon for engaging one edge of the collapsed carton, a pair of rotary cam members arranged to engage the opposite edge of said carton to compress said carton against said engaging means to open said carton, one of said cam members being arranged to engage the edge of said carton in advance of the other cam member to cause the opening of said carton to progress from one end of said carton to the other end thereof.

6. An apparatus for opening collapsed cartons comprising a carrier having a recess therein, means for posi-

tioning a collapsed carton on said carrier with one edge of the carton seated in one corner of the recess, a pair of rotary cam members for engaging the opposite edge of said carton, and means for moving said carrier toward said cam members to cause said carton to be opened and seated in said recess, one of said cam members being arranged to contact said carton in advance of the other cam member so that said carton will be compressed adjacent one end thereof prior to compression against the opposite end so that the opening of said carton will progress from one end to the other thereof.

7. An apparatus for opening a collapsed carton having walls arranged to form a tubular member with open ends, one of said walls having a notch therein at one end of said carton, said apparatus comprising a pin member, and rotatably mounted pin means having a circular path of travel past said pin member for engaging said carton at a point spaced from said pin member for moving said carton relative to said pin member so that said pin member passes through said notch into engagement with the inner face of the other wall of said carton so that said walls are separated from

one another adjacent one end of said carton in advance of the separation of said walls adjacent the opposite end of said carton.

8. An apparatus for opening collapsed cartons comprising a carrier having teeth thereon forming recesses, means for placing a collapsed carton on said carrier, pin means for engaging said carton to separate partially the walls thereof adjacent one end of said carton, rotary means for facilitating the action of said pin means and for seating the rear edge of said carton in a corner of said recesses, and a rotary cam member for engaging the front edge of said carton to cause the separation of said walls to progress from the partially separated end thereof to the opposite end of said carton.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,486,598	Milmoe	Mar. 11, 1924
2,441,372	Quigley	May 11, 1948