United States Patent

[11] **3,593,625**

[72] Inventors **Howard R. Garrett**
St. Paul;
Percy King, Bloomington, both of, Minn.

[21] Appl. No **778,135**
[22] Filed **Nov. 22, 1968**
[45] Patented **July 20, 1971**

[73] Assignee **Haskon, Inc.**
St. Paul, Minn.

[54] **BOTTOM PRE-BREAKING MECHANISM FOR A CARTON FORMING MACHINE**
4 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **93/84 TW,** 93/44.1 GT, 93/59 CE
[51] **Int. Cl.** **B31b 1/52,** B31b 45/00, B31f 1/08
[50] **Field of Search** ..... 93/44.1, 59 CE, 59 ES, 84 FF, 94

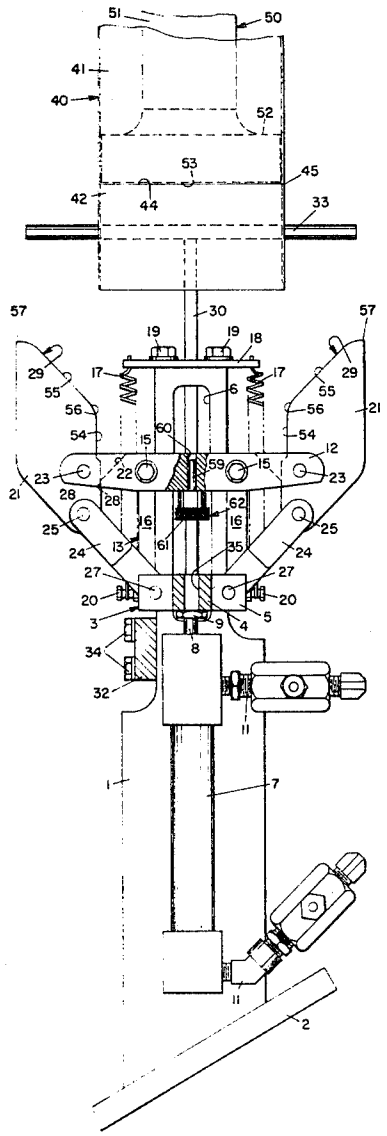
[56] **References Cited**

UNITED STATES PATENTS

3,525,194	8/1970	Moors	93/44.1 (GT)
Re. 26,699	10/1969	Austin	93/59 (CE)
3,183,801	5/1965	Egleston	93/44.1 (GTF)
3,187,646	6/1965	Monroe	93/44.1 (GTF)
3,212,413	10/1965	Allen	93/44.1 (GTF)
3,248,841	5/1966	Heffelfinger	93/44.1 (GTF)
3,398,659	8/1968	Egleston	93/84 (TW)
3,403,606	10/1968	Gartin	93/44.1 (GTF)
3,405,505	10/1968	Mistarz	93/44.1 (GTF)
3,408,905	11/1968	Hoff	93/84 (TW)
3,486,423	12/1969	Mistarz	93/84 (TW)

Primary Examiner—Wayne A. Morse, Jr.
Attorney—Edwin H. Dafter, Jr.

ABSTRACT: This invention relates to a machine for erecting paper cartons from flat blanks and particularly to the mechanism for prebreaking the bottom panels of the carton in a machine for erecting two different cross-sectional sizes of cartons and consists of a pair of fingers that are pivotally mounted for movement of their working ends inwardly against the infolding panels of the carton, which fingers have a cam face that extends from a point outwardly of the sidewalls of the small size carton but inwardly of the sidewalls of the large size cartons to a point that is outwardly of the sidewalls of the large size cartons.



PATENTED JUL 20 1971

3,593,625

SHEET 1 OF 2

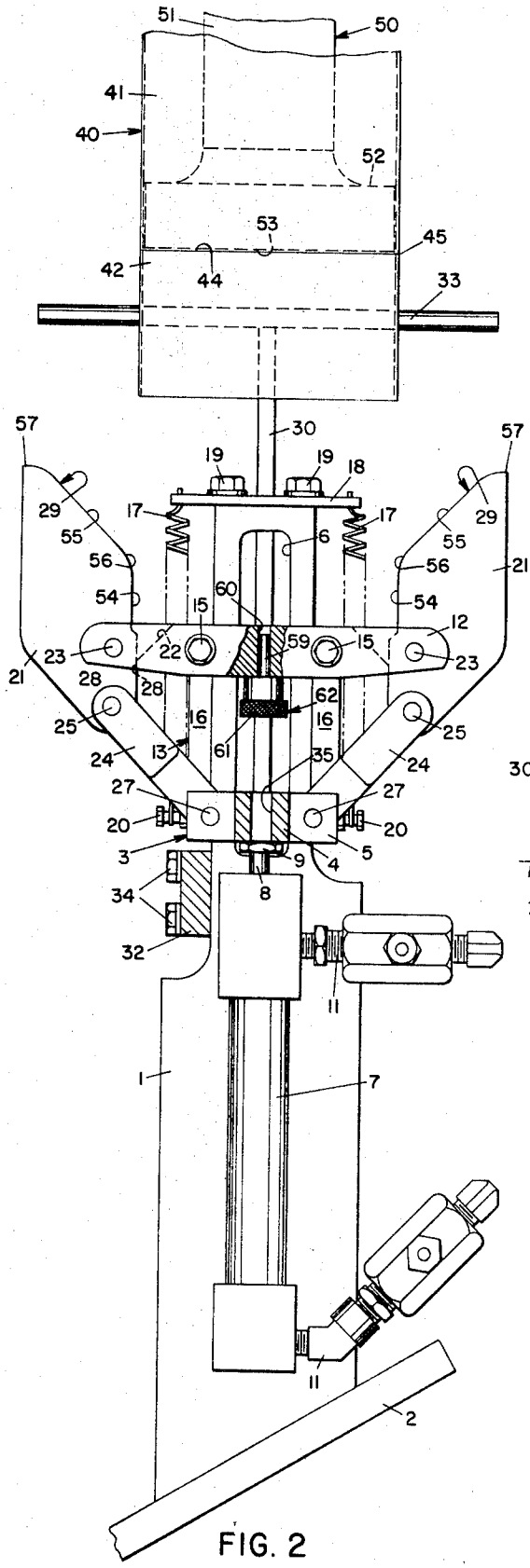


FIG. 2

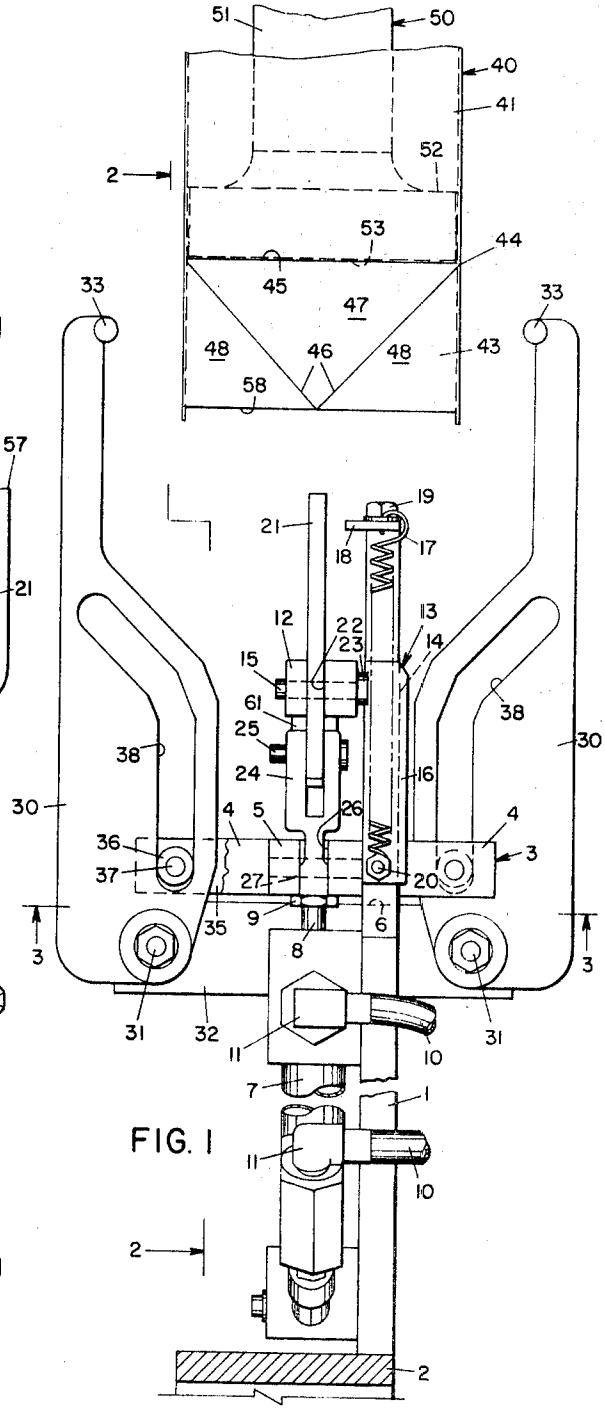


FIG. 1

HOWARD R. GARRETT
PERCY KING
INVENTORS.

BY Edward L. Bell

ATTORNEY

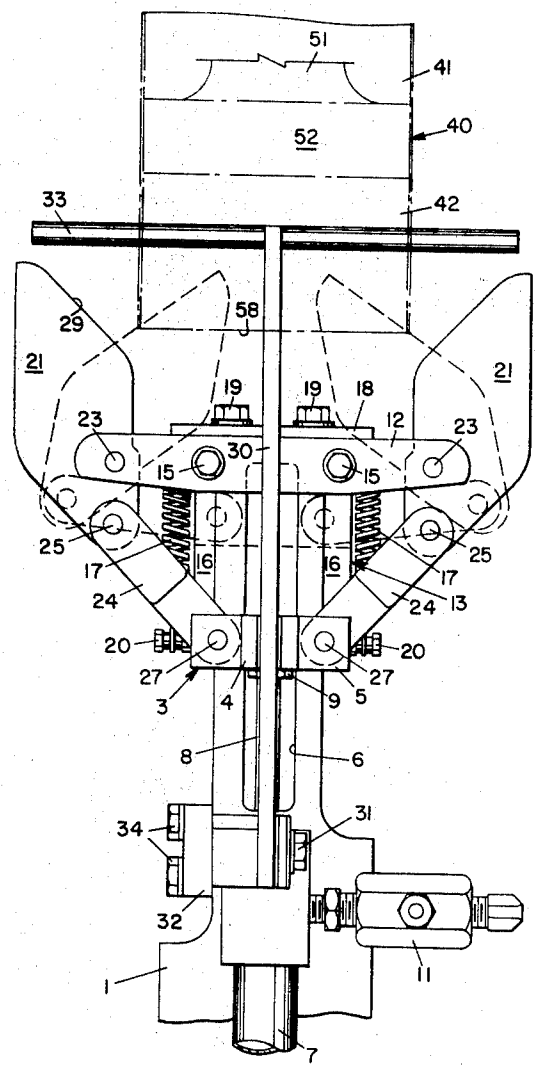


FIG. 4

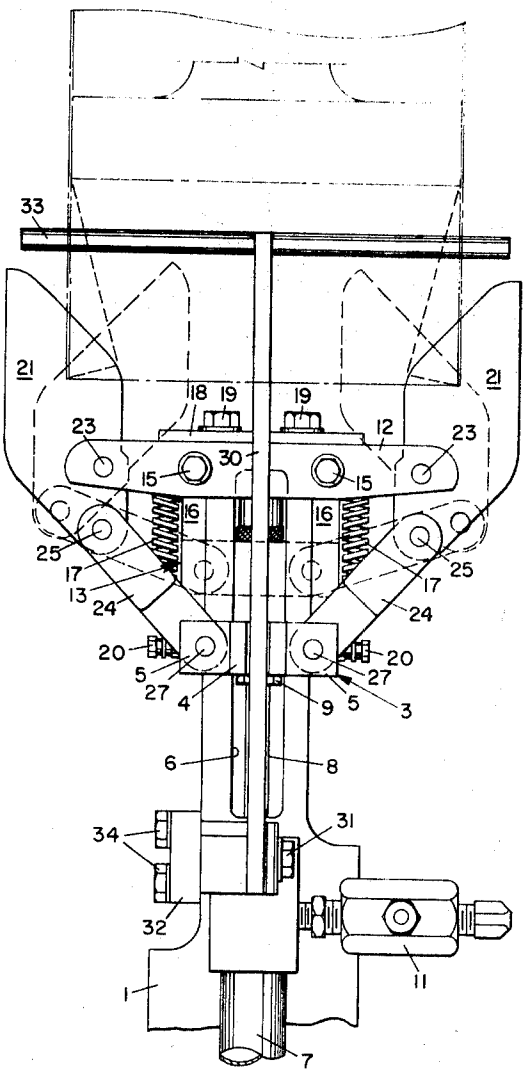


FIG. 5

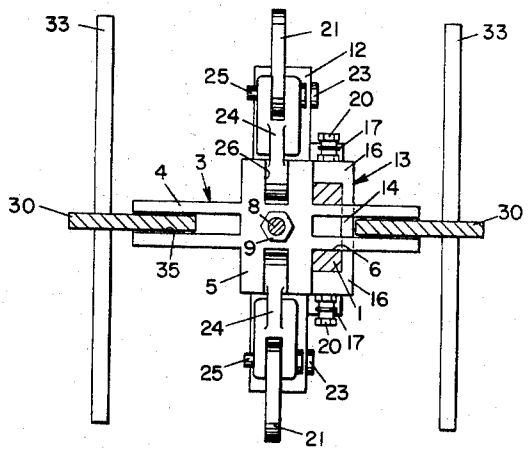


FIG. 3

HOWARD R. GARRETT
PERCY KING
INVENTORS.

BY Edward L. Bell

ATTORNEY

BOTTOM PRE-BREAKING MECHANISM FOR A CARTON FORMING MACHINE

The present invention relates to a mechanism for prebreaking the bottom panels of a paper carton such as a paper milk carton and more particularly a paper carton such as that forming the subject matter of the U.S. Pat. No. 3,120,335, to Egleston, Feb. 4, 1964, which patent relates to the widely popular "PURE-PACK" carton.

The above referred to paper cartons are generally rectangular, or more particularly, square in cross section, and have a bottom that is formed by four panels each of which depends from and in effect constitutes a continuation of one of the sidewalls of the carton. The bottom panels are infolded and sealed to close the bottom of the carton and include a first pair of opposed panels that are flat and which as a pair define the exposed portion of the bottom of the carton, and a second pair of opposed panels each panel of which is infolded on score or bend lines extending from the midpoint of the outermost edge of the respective panel to the corners defined by the outer edge of the panel and the bend lines between the panel and the respective sidewall of the carton.

In forming or erecting a paper carton from a flat carton blank, by a carton forming machine such as that forming the subject matter of the U.S. Pat. No. 3,364,826 of Austin et al., Jan. 23, 1968, the carton is initially opened and inserted onto a mandrel, and then, in successive operations as the mandrel is indexed to successive stations, the bottom panels are prebroken, heated to soften the plastic coating and thus to render them sealable, and are folded to close and seal the bottom. The top panels of the carton are also prebroken and the carton is withdrawn from the mandrel to be filled and finally closed at the top. The present invention is directed specifically to the prebreaking mechanism for the bottom panels of the carton in the carton forming machine that forms the subject matter of the above noted Austin et al. patent.

With a prebreaking mechanism such as that disclosed in the Austin et al. patent, the carton is placed between a pair of opposed prebreaking fingers for the infolded bottom panels (i.e., the fingers **130** and **131** of the above noted Austin et al. patent), which fingers are then pivoted to move the free ends thereof against the infolding panels to infold them about the preformed bend lines. Such an arrangement is suitable for use with a machine designed to process paper cartons having the cross section of the usual half-gallon carton as well as those having the cross section of the quart carton. However, for a machine designed to process both half-gallon and gallon cartons, the differences in the transverse dimension of the two cartons is so great that with the prebreaking fingers spaced sufficient to receive the gallon carton between the same, the fingers must be very long and they must be moved over a large arc in order to engage and infold the panels of the half-gallon carton.

Accordingly, it is a primary object of this invention to provide a prebreaking mechanism for the bottom panels of a paper carton forming machine, which mechanism will function effectively with cartons having a significant difference in the cross-sectional dimensions thereof, and which mechanism is simple, inexpensive, efficient, easy to operate and trouble-free.

Further objects of this invention are to provide a prebreaking mechanism for the bottom panels of a paper carton forming machine having a simplified means for breaking the flat panels, which means is inexpensive and will have a positive action during both opening and closing so that the extent and timing of the action is predetermined.

With the above and other objects in view, the present invention is hereinafter described with reference to the accompanying drawings, in which:

FIG. **1** is a plan view of a prebreaking mechanism in accordance with this invention.

FIG. **2** is a sectional view taken substantially on the line **2–2** of FIG. **1**.

FIG. **3** is a sectional view taken substantially on the line **3–3** of FIG. **1**.

FIG. **4** is a side view of the mechanism of FIG. **1** illustrating the parts in the prebreaking position FIG. **5** is a side view similar to FIG. **1** illustrating the mechanism with a larger size carton.

The illustrated prebreaking mechanism comprises a supporting member **1** that is secured at its end to and projects endwise from a frame member **2** of the machine.

A cross-shaped slide **3** which comprises two pairs of bifurcated arms **4** and **5** arranged normal to each other, has one of the arms **4** thereof extending through a slot **6** (FIG. **2**) formed longitudinally of the member **1**. The slide **3** is moved endwise of the supporting member **1** by fluid pressure means comprising a double acting air cylinder **7** secured to the slide **3** for example by threading the end of the piston rod **8** thereof into a tapped opening in the member **3** and locking the same by a locknut **9**. Air under pressure from a source is directed through suitable valving mechanism (not shown) selectively to the opposite ends of the cylinder **7** by conduits **10** and fittings **11** to drive the piston rod **8** positively in both its advance and return strokes.

A supporting bar **12** is mounted on the member **1** outwardly of the slide **3** by means of a block **13** having a crossbar **14** and a pair of angle pieces **16** that embrace the edge of the supporting member **1** for supporting the block **13** on the member **1** for sliding movement endwise along the same. The bar **12** is secured to the block **13** and thus the bar **12** is biased toward the free end of the supporting member **1** by a pair of tension springs **17** that are anchored at their opposite ends to a plate **18** secured by screws **19** to the end of the member **1** and to studs **20** secured to the arms **16** of the block **13**.

The carton engaging elements which engage and prebreak the bottom panels of the carton comprise an opposed pair of fingers **21** that are seated in slots **22** in the ends of the bar **12** and are pivotally mounted therein by a pivot pin **23**. Each of the fingers **21** is connected individually to the slide **3** by a link **24** that is connected at one end to the finger **21** by a pivot pin **25** and has the other end disposed in a slot **26** extending inwardly from the free end of the arms **5** of the slide **3** and pivotally connected thereto by a pivot pin **27**. The line **24** is preferably arranged at an angle of about 45 ° relative to the direction of movement of the slide **3** and the pivot pin **25** is substantially aligned with the pivot pin **23** in the direction of movement in order to avoid binding and also to provide a smooth arcuate movement to the finger **21** while avoiding the necessity for an excessive throw of the slide **3**.

The bottom of each of the slots **22** in the bar **12** is formed with a stop shoulder **28** that limits pivotal movement of the respective finger **21** in the direction in which the carton engaging end of the finger moves away from the carton, that is, the shoulder **28** limits clockwise movement of the finger **21** that is at the right in FIG. **2** and counterclockwise movement of the finger **21** that is at the left in FIG. **2**. The shoulders **28** thus determine the pivotally retracted positions of the fingers **21**. The fingers **21** each have a carton engaging edge **29** and are arranged with the edges **29** opposed and in a plane that is substantially normal to the axis of the mechanism, that is, endwise of the supporting member **1**.

The means for prebreaking the flat bottom panels of the carton comprise a pair of levers **30** that are pivotally mounted at their one end by pivot screws **31** on a cross bar **32** secured to the supporting member **1** as by screws **34** and are provided at their free ends with a transverse carton engaging bar **33**. The arms **4** of the slide member **3** are formed with slots **35** into which the levers **30** extend. The levers are each actuated about its pivot axis at the pivot screw **31** by a cam follower means in the form of a roller **36** that is disposed in the slot **35** and journaled on an axis **37**, the roller being seated in a cam slot **38** in the respective lever **30**. Thus, as the slide **3** is moved relative to the levers **30**, the rollers **36** track the slot **38** to swing the levers **30** positively about their pivot axes to move the carton engaging bars **33** into and out of engagement with the carton.

In FIGS. 1 and 2 there is illustrated the bottom portion of a carton 40 which has a body portion formed by four sidewalls 41 defining a square cross section and a bottom panel member depending from and constituting a continuation of each of the side walls 41. The panel members comprise a pair of flat panels 42 (FIG. 2) on two of the opposite sides of the carton and a pair of infolding panels 43 (FIG. 1) on the other two or intermediate sides of the carton. Each of the panels 42 is adapted to be folded about a bend line 44 transversely of the carton between the panel and the respective sidewall 41. Each of the panels 43 is also adapted to be folded about a bend line 45 transversely of the carton between the panel and the respective sidewall 41. While the panels 42 remain flat when they are folded to their closed position about the bend line 44, the panels 43 are infolded about a pair of bend lines 46 which extend from the free edge of the panels 43 at substantially the midpoint thereof toward the outer corners of the panels at the bend line 45. There is thus formed three triangular sections including a central section 47 bounded by a bend line 45 and the bend lines 46, and two outer triangular sections 48 each of which is bounded by a bend line 46 and the respective side edge of the panel and the adjacent one-half of the free edge of the panel.

The carton 40 is presented to the prebreaking mechanism on a mandrel 50 which may be of the type forming the subject matter of the Austin et al. U.S. Pat. No. 3,377,928. The mandrel 50 includes a post 51 and a replaceable end cap 52 that is mounted on the free end thereof and is adapted to be interchanged when the machine is adjusted to form different size cartons. The end cap 52 has a cross section that substantially matches that of the carton to be formed and is dimensioned to be received within the carton with a relatively close fit.

In operation, at a station preceding the prebreaking station the carton 40 is opened and inserted onto the mandrel and positioned with the bend lines 44 and 45 aligned with the outer edges 53 of the end cap 52. After the carton is positioned on the mandrel, the machine is indexed to move the mandrel and thus the carton to the prebreaking station and to position the carton relative to the prebreaking mechanism as illustrated in FIG. 1, that is, with the mandrel 50 and thus the carton 40 aligned axially with the intersection of the planes defined by the fingers 21 and levers 30 and with the carton positioned endwise relative to the prebreaking mechanism. Thus, when the bars 33 of the levers 30 are pivoted inwardly, they initially engage the panels 42 along lines below the bend lines 44 but near the top of the bottom panels and remain in engagement with the bottom panels as they move inwardly, thereby swinging the panels 42 about the bend lines 44 toward their closed positions.

The cylinder 7 is then actuated to advance the slide 3 from its inoperative position as illustrated in FIGS. 1 and 2, toward the carton. As the slide 3 advances, it permits the springs 17 to advance the block 13 toward the carton. This movement continues until the block 13 is in its operative position, that is, until it is stopped against the plate 18. Continued advance of the slide 3 by the cylinder 7 then advances the slide 3 relative to the block 13 which, through the links 24, swings the fingers 21 about their pivot axes at the pivot pins a3 from their pivotally retracted to their prebreaking position. Simultaneously, the interconnection at the rollers 36 and cam slot 38 between the slide 3 and levers 30 swings the levers 30 inwardly as the slide 3 advances. Upon completion of the advance stroke, the cylinder 7 is reversed, for example by a suitable limit switch or a cycling mechanism (not shown). In the return stroke of the cylinder 7, the levers 30 are swung out and, through the links 24, the fingers 21 are initially returned to their retracted position determined by the stop shoulders 28 and the block 13 is thereafter pulled to its retracted or inoperative position against the tension of the springs 17.

The bars 33 are spaced apart a distance sufficient to accommodate the largest carton for which the machine is designed, that is, for example a gallon carton which has a cross section that is about 5 ½inches in a machine that is designed to form both gallon and half-gallon cartons. The levers 30 are also relatively long and the pivot screws 31 are located at the ends of the levers remote from the cartons and substantially in alignment with the sidewalls of the carton. Thus, over the relatively short arc that the levers 30 are moved, the bars 33 are moved primarily in the direction transverse to the carton and there is only a minimum component of motion in the direction endwise of the carton. In this manner, the bars 33 are adapted to engage the panels 42 of a half-gallon carton which has a cross section of only 3¾inches as well as those of a gallon carton.

Each of the fingers 21 is provided with a first edge portion 54 that is substantially straight and, in the pivotally retracted position of the fingers as illustrated in FIG. 1, which is the position determined by the stops 28, is substantially parallel to the axis of the carton 40. Each finger 21 also has a second edge portion 55 that extends from the leading end 56 of the first edge portion 54 and constitutes a smooth extension thereof but is inclined outwardly at an acute angle relative to the carton axis to a tip 57, the illustrated angle being 45°. The first edge portions 54 are spaced apart a distance that is about equal to the transverse dimension of a small carton, i.e., a half-gallon carton on a machine that is designed to form both gallon and half-gallon cartons. This spacing of the first edge portions 54 is less than the transverse dimension of a large carton and the tips 57 are spaced apart a distance greater that the transverse dimension of a large carton so that the free edges 58 of the relatively longer and more widely spaced panels 43 of the large carton will be engaged and cammed inwardly by the second edge portion 55 as the fingers are advanced endwise relative to the carton axis from the inoperative position as illustrated in FIG. 1 to the operative position as illustrated in FIG. 5.

The fingers 21 are arranged substantially in a plane transversely and through the axis of the carton 40, or, in other words, is normal to and through the longitudinal centerline of the bottom panels 43 and the respective sidewalls of the carton. The fingers 21 are also dimensioned so that when they are advanced to their operative position, the leading end 56 of the first edge portions 54 is slightly below the free edge 58 of a small carton. Thus, when the fingers 21 are moved pivotally from their pivotally retracted position to their prebreaking position, that is, from the full line to the dotted line positions in FIG. 4, the initial engagement between the fingers 21 and the panels 43 is substantially at the midpoints of the free edges 58 of the panels 43, that is, at the juncture of the free edges 58 and the bend lines 46. Each of the panels 43 is thus smoothly and reliably infolded about the designed bend lines. After the initial folding of the panel 43 by the leading end 56 of the finger 21, the continued pivotal movement of the finger 21 brings the tip 57 of the finger against the panel 43 to extend the prebreaking movement. The tips 57 of the fingers are, as illustrated, located relative to the pivot pins 23 so that upon pivotal movement of the fingers 21, the tips move essentially in a direction normal to the axis of the carton and have a minimum component of motion in the direction endwise of the carton. At the end of the prebreaking movement of the fingers 21, the edge portions 55 are substantially parallel to but spaced from the carton axis, as illustrated for example in dotted lines in FIG. 5, and the tips 57 are operative to provide the desired prebreaking action.

With a large carton as illustrated in FIG. 5, the endwise movement of the fingers 21 from the inoperative to the operative position moves the edge portions 55 against the free edges 58 of the panels 43. Again, the initial contact between the panels 43 and the fingers 21 is at the intersection of the free edges 58 and the bend lines 46 to insure infolding the cartons at the bend lines as the panels are cammed inwardly by the edge portions 55. The infolding of the panels 43 proceeds smoothly from the initial bending as the fingers 21 are pivoted to advance the edge portions 55 and finally the tips 57 against the same.

Because of the difference in the length of the panels **42** and **43** of the large size cartons over that of the small size cartons, the arc through which the fingers **21** are moved to effect a predetermined prebreaking action for the small cartons is greater than that through which they are moved for the large cartons. For this reason, there is provided a stop element **62** that is used with the large cartons, the stop element having a shank **59** that is releasably inserted into an aperture **60** in the bar **12** and having a head **61** that is in the path of the slide **3** to limit endwise movement thereof. When small cartons are formed, the stop element is stored by inserting the same into the aperture **60** from the other side of the bar **12**.

We claim:

1. In a carton forming machine for forming selectively either small or large paper cartons from blanks having sidewalls adapted to be opened to form a body portion of a rectangular cross section and bottom panels integral with the sidewalls and adapted to be folded and sealed to close the bottom of the carton, said machine having a bottom panel prebreaking station and means for advancing an opened carton to and for supporting the same at the prebreaking station, and prebreaking mechanism comprising:

a pair of fingers of substantially identical shape;

means for mounting said fingers in opposed relation substantially normal to and aligned with the longitudinal center line of an opposed pair of the side walls of a carton at the prebreaking station and for movement endwise of the axis of the carton between an operative and an inoperative position and for pivotal movement in the operative position between a prebreaking position and a pivotally retracted position;

means for imparting said endwise and said pivotal movement to said fingers;

said fingers having opposed first edge portions that are substantially straight and parallel to the carton axis in the pivotally retracted position of the fingers and are spaced apart a distance greater than the transverse dimension of the small cartons and less than the transverse dimension of the large cartons, said first edge portions having leading end portions, and second edge portions inclined outwardly at an acute angle relative to the carton axis from the leading ends of the first edge portions and having tips disposed outwardly of the sidewalls of a large carton to permit said second edge portions to engage free edges of a respective opposed pair of said bottom panels upon endwise movement of the fingers from the inoperative to the operative positions to cam the same inwardly, said tips being disposed relative to the pivot axes of said fingers for movement from positions outwardly of the sidewalls of a large carton to positions adjacent to the carton axis upon pivotal movement of said fingers, the path of movement of said tips being essentially normal to the carton axis and intersecting the bottom panels adjacent the upper portions thereof; and

a pair of levers for engaging and inwardly bending an opposed pair of bottom panels intermediate the pair engaged by said fingers, said levers being pivoted on said finger mounting means and having cam means cooperating with cam follower means on said means for imparting movement to the fingers to impart pivotal movement to said levers.

2. In a carton forming machine in accordance with claim **1** in which the means for mounting said fingers comprises a supporting member, a supporting bar mounted on said supporting member for sliding movement in a direction of the carton axis, means for pivotally mounting said fingers on said supporting bar, and stop means for limiting pivotal movement of said fingers in said pivotally retracted position.

3. In a carton forming machine in accordance with claim **2** in which the means for imparting endwise and pivotal movement to said fingers comprises means for biasing said supporting bar in the carton engaging direction, stop means for limiting the sliding movement of said supporting bar under the action of said biasing means, a slide mounted on said supporting member on the opposite side of said supporting bar from said first and second edge portions for sliding movement in the direction of the carton axis, links interconnecting said slide and said fingers, and means for imparting movement to said slide.

4. In a carton forming machine in accordance with claim **3**, in which said pair of levers are pivoted on the supporting member and the cam follower means for imparting pivotal movement to said levers is located on said slide.