Dec. 19, 1967 E. L. BJORK ET AL 3,358,419

PACKAGING MACHINE

Filed April 15. 1964 4 Sheets-Sheet 1

Fig. 1

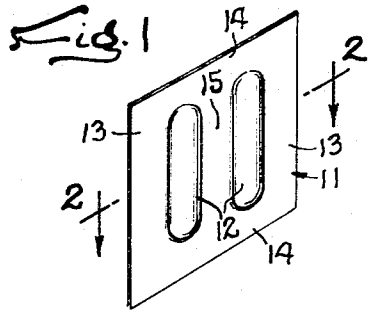


Fig. 2

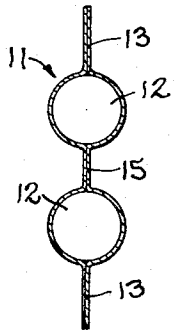
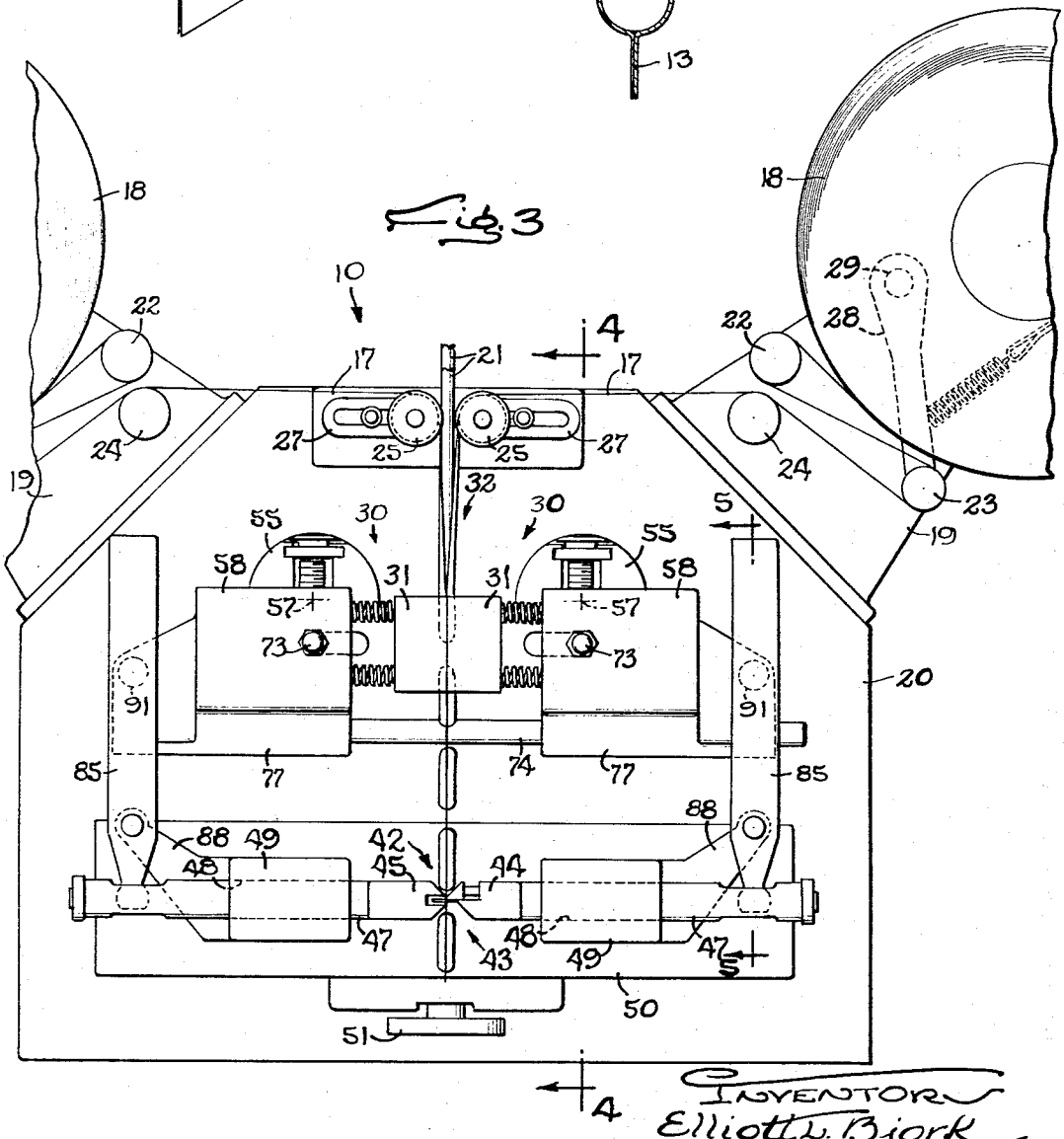


Fig. 3



INVENTOR
Elliott L. Bjork
Cleon F. Kern
Wolfe, Hubbard, Voit & Osann
ATTORNEY

Dec. 19, 1967 E. L. BJORK ET AL 3,358,419

PACKAGING MACHINE

Filed April 15, 1964 4 Sheets-Sheet 2

Fig. 4

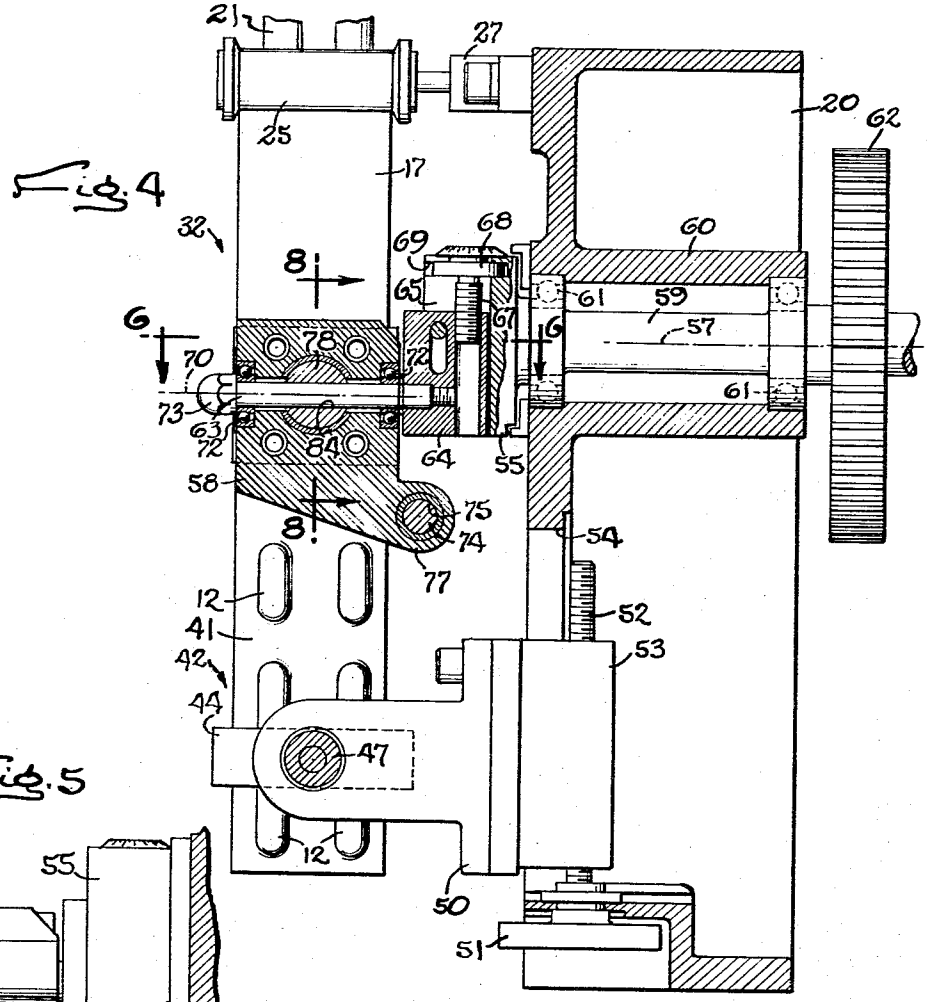


Fig. 5

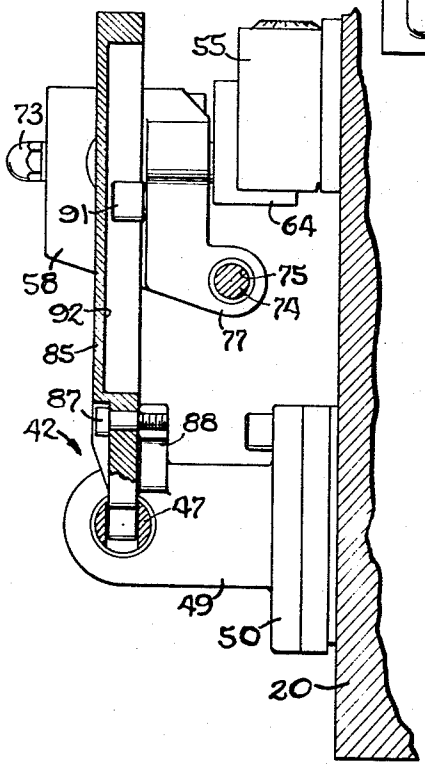
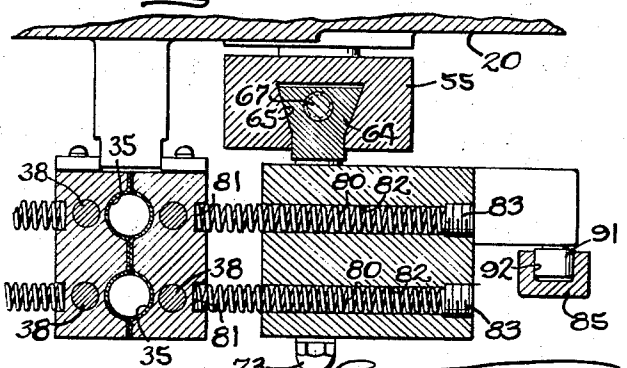


Fig. 6



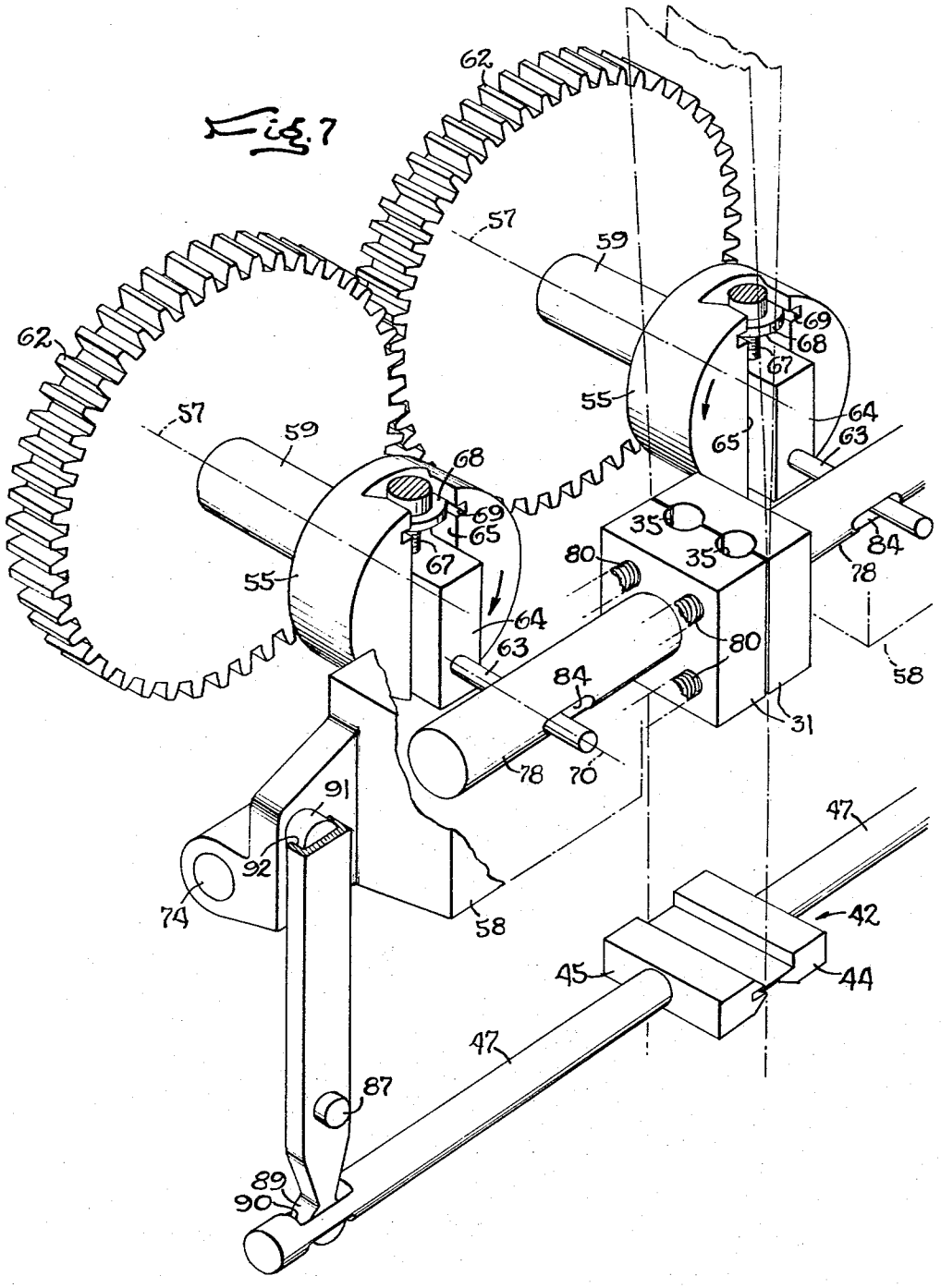
INVENTORS
Elliott L. Bjork
Cleon F. Kern
Wolfe, Hubbard, Voit & Osann
ATTORNEYS

Dec. 19, 1967 E. L. BJORK ET AL 3,358,419

PACKAGING MACHINE

Filed April 15. 1964 4 Sheets-Sheet 3

Fig. 7



INVENTORS
Elliott L. Bjork
Cleon F. Kerry
Wolfe, Hubbard, Voit & Osann
ATTORNEYS

Dec. 19, 1967 E. L. BJORK ET AL 3,358,419

PACKAGING MACHINE

Filed April 15, 1964 4 Sheets-Sheet 4

Fig. 8

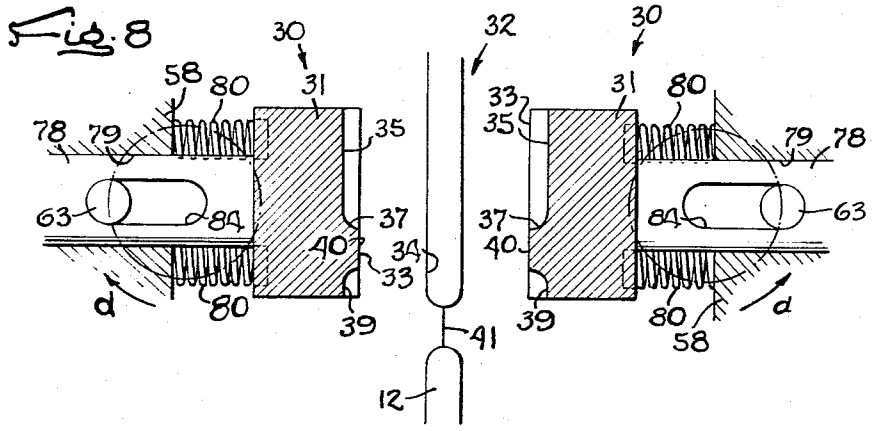


Fig. 9

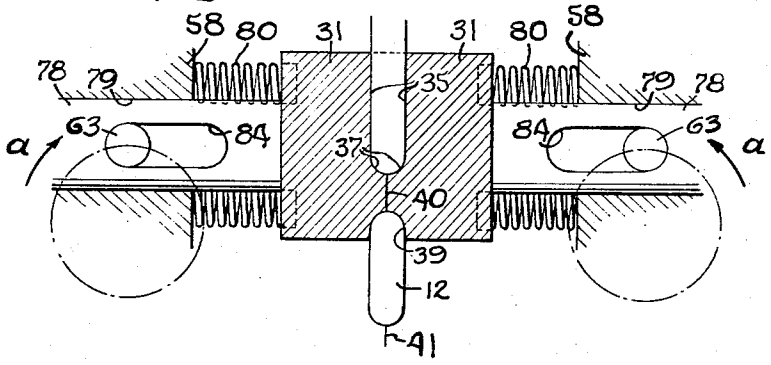
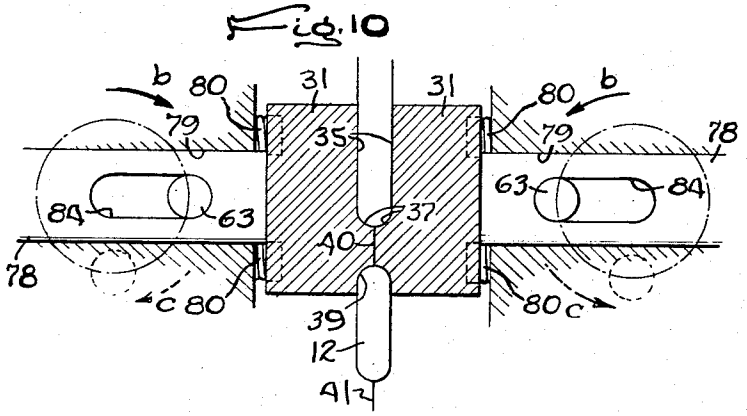


Fig. 10



INVENTORS

Elliott L. Bjork

Cleon F. Kern

Wolfe, Hubbard, Voit & Osann

ATTORNEYS

United States Patent Office 3,358,419 Patented Dec. 19, 1967

3,358,419

PACKAGING MACHINE

Elliott L. Bjork and Cleon F. Kern, Dexter, Mich., assignors to Bartelt Engineering Company, Inc., Rockford, Ill., a corporation of Delaware

Filed Apr. 15, 1964, Ser. No. 359,830
2 Claims. (Cl. 53—180)

This invention relates generally to machines for forming and filling packages comprising two sheets of material disposed in opposed face-to-face relation and sealed together along the side and end margins to define a compartment between the sheets enclosing a quantity of packaged material. More particularly, the invention relates to a machine for drawing two elongated webs of material into opposed face-to-face relation along opposite sides of a filling spout, sealing the webs together around the spout to form a pocket, advancing the webs longitudinally to move the pocket away from the spout, sealing the open end of the pocket after the latter is filled, and finally severing the completed package from the webs.

In such machines, the webs are sealed togeter around the compartments by two sealing units disposed on opposite sides of the webs level with the end of the filling spout and movable toward each other and the webs to press the latter together around the spout and, after a quantity of product is dispensed through the spout, operable to seal the open end of each pocket. A reciprocating cut-off member spaced longitudinally along the webs from the sealing units engages and severs the webs along the seals between adjacent completed compartments.

The general object of the present invention is to simplify the overall construction of a machine of the foregoing character so that the machine may be compact and relatively inexpensive in construction and operation.

A more specific object is to mount and operate the sealing units in a novel and extremely simple manner and utilize the units not only as means for sealing the webs together but also as means for advancing the webs through the machine.

Another object is to utilize the same simple drive elements that support and operate the sealing units for operating the cut-off device in timed relation with the sealing units.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

FIGURE 1 is a perspective view of an illustrative package formed by a machine embodying the novel features of the present invention.

FIG. 2 is an enlarged cross-sectional view taken along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary front elevational view of a machine embodying the novel features of the invention.

FIG. 4 is an enlarged fragmentary cross-sectional view taken substantially along the line 4—4 of FIG. 3.

FIG. 5 is an enlarged fragmentary cross-sectional view taken substantially along the line 5—5 of FIG. 3.

FIG. 6 is a fragmentary cross-sectional view taken substantially along the line 6—6 of FIG. 4.

FIG. 7 is a fragmentary perspective view of the operating mechanism of the machine.

FIG. 8 is an enlarged fragmentary cross-sectional view taken substantially along the line 8—8 of FIG. 4 and illustrating one position of the sealing units.

FIG. 9 is a view similar to FIG. 8 showing another position of the units.

FIG. 10 is a view similar to FIG. 9 showing still another position.

As shown in the drawings for purposes of illustration, the

invention is embodied in a machine 10 for forming and filling packages 11 comprising two sheets of heat sealable material such as polyethylene disposed in opposed face-to-face relation and sealed together around one or more capsules or compartments 12 containing the packaged product. In this instance, two elongated tubular compartments are formed between the sheets which are rectangular in shape and are sealed at 13 along the side margins and at 14 across the top and bottom margins. The two compartments are separated by a central longitudinal seal 15.

In the illustrative machine 10 for forming and filling packages 11 with two compartments 12, two elongated webs 17 of package material are drawn off two supply rolls 18 (FIG. 3) journaled on posts 19 on opposite sides of the machine base 20 and are guided longitudinally with an intermittent motion into opposed face-to-face relation and along opposite sides of a pair of vertical filling spouts 21 having open lower ends for dispensing the product to be packaged. Herein, the means for guiding each web off the supply roll and into the desired relation with the filling spouts comprise a set of horizontal rollers 22, 23, 24 and 25. The web first comes tangentially off the bottom of the supply roll generally toward the filling spouts and then reverses its direction around the first guide roller 22 which is journaled on the post 19. Then the web again reverses itself around the second roller 23 on the post and extends back toward the filling spouts and over the third roller 24. The fourth roller 25 is journaled on the base close to the adjacent sides of the filling spouts 21 and preferably is mounted on a bracket 27 which is adjustable toward and away from the spouts to position the roller to lead the web along the spouts precisely as desired.

To maintain a substantially constant tension in the web 17, the second roller 23 is journaled on the free lower end of a lever 28 pivoted at 29 at its upper end on the post 19 and spring-urged away from the spouts 21. Thus, the lever yields toward the spouts when the tension in the web tends to increase as material is being fed through the machine, and swings back away from the spouts to strip additional material off the supply roll 18 when the webs are not feeding through the machine.

Mounted on the machine base 20 on opposite sides of the filling spouts 21 are two sealing units 30 each including a sealing bar 31 projecting toward the webs 17 and toward each other at a sealing station 32 level with the lower end of the filling spout, and the opposed faces 33 of the bars are shaped to fit together around the spouts to seal the webs together and form two open-ended pockets 34 (see FIG. 8) in the webs around the spouts which, therefore, initially serve as mandrels for shaping the pockets. For this purpose, identical and alined pairs of generally semi-cylindrical recesses 35 are formed in the upper portions of the sealing faces with the upper ends of the recesses opening through the top surfaces of the sealing bars. The lower end wall of each recess curves outwardly at 37 to the plane of the sealing face 33. Thus, when the sealing faces are pressed together on opposite sides of the webs and the filling spouts, the flat portions of the faces are pressed together on opposite sides of the spouts to form the side seals 13, beneath the spouts to form the bottom seal 14, and between the spouts to form the dividing seal 15. Heating elements 38 (FIG. 6) embedded in the seal bars 31 maintain the latter at a temperature sufficiently high to heat the portions of the webs pressed together between the bars and weld or fuse them together.

After each pair of pockets 34 is formed in the webs 17, the latter are drawn downwardly through the machine 10 and another pair of pockets is formed at the sealing station 32 by pressing the sealing faces 31 together in the above manner. At the same time, the lower portions

of the sealing faces complete a pair of campartments **12** by closing the upper ends of the preceding pair of pockets as shown in FIGS. 3, 9 and 10. For this purpose, two additional pairs of shorter semi-cylindrical recesses **39** are formed in the lower portions of the sealing faces below the recesses **35** and in longitudinal alinement therewith. The upper ends of these recesses are spaced below the upper pair and the lower ends open downwardly through the lower surfaces of the seal bars. Thus, the lower portions of the sealing faces engage the webs along the sides of the pockets and flat portions **40** of the faces between the two sets of recesses form cross seals **41** closing the pockets. The length of the pockets **34** as initially formed preferably is such that the recesses **39** overlie the upper ends of the pockets and the flats **40** seal their upper end portions rather than increasing their length.

During continued operation of the machine **10**, successive longitudinally spaced pairs of compartments **12** are formed in the webs **17** as shown in FIG. 3 and are lowered step by step into a cut-off station **42** spaced below the sealing station **32**. At the cut-off station, a cut-off device **43** engages the webs between adjacent pairs of compartments and severs the webs along the cross seals **42** to form individual packages **11**. Herein, the cut-off device **43** comprises opposed blade and anvil members **44** and **45**, respectively, each mounted on an enlongated rod **47** telescoped through a horizontal bore **48** in a wing **49** projecting forwardly from a mounting plate **50** supported on the front side of the base **20**. The blade **44** and the anvil **43** are secured to the ends of the rods adjacent the webs so that back and forth reciprocation of the rods moves the blade and the anvil into engagement with opposite sides of the webs as shown in FIGS. 3 and 7 between successive pairs of completed compartments **12**. The level of the cut-off device is adjustable by means of a screw **51** (FIGS. 3 and 4) journaled on the base for rotation in an axially fixed positioned with the upwardly extending shank **52** of the screw threaded through a lug **53** fast on the back of the supporting plate **50**. This lug projects rearwardly through and is slidably guided in a vertically elongated slot **54** in the base. Thus, by turning the screw **51**, the supporting plate may be raised and lowered to position the cut-off members **44** and **45** for engagement with the cross seals **41** at the precise level desired.

In accordance with the present invention, the sealing units **30** and the cut-off device **43** are mounted and operated in a novel manner which simplifies the overall construction of the machine **10** and, in particular, the supporting and driving mechanism for the operating elements and permits the machine to be made compactly and relatively inexpensively. For these purposes, the sealing units are supported on two rotary drive elements **55** for movement along orbital paths and serve not only as means for sealing the webs **17** but also as means for drawing the webs off the supply rolls **18**, and the cut-off device is operated in an equally simple manner by the same rotary drive elements that support and operate the sealing units.

To support and move the sealing bars **31** through their motions, the drive elements **55** take the form of disks journaled on the base **20** for rotation in opposite directions about axes **57** disposed on opposite sides of the webs **17** and spaced from the latter, and the sealing bars are supported on a pair of carriers **58** each pivotally supported on one of the disks for orbital motion about the axis of the associated disk with the sealing bar projecting toward the webs from the carrier. Herein, the disks are fast on the front ends of two shafts **59** projecting through two sleeves **60** (see FIG. 4) preferably cast integrally with the base **20**, and are journaled in antifriction bearings **61** in the sleeves for rotation about the parallel axes **57**. Fast on these shafts behind the base are two meshing spur gears **62** (FIGS. 4 and 7), one of the shafts being rotated by a suitable actuator (not shown) which thus rotates both disks **55** to operate the machine.

As shown most clearly in FIGS. 4 and 7, each carrier **58** is pivotally mounted on the associated drive disk **55** by means of a pin **63** fast at one end in a bar **64** slidably supported on the disk in a diametrical groove **65** (see FIGS. 6 and 7) and adjustably positioned along the groove by a screw **67** having a radial flange **68** adjacent its head fitted into notches **69** in the sidewalls of the groove. The shank of the screw is threaded into one end of the bar **64**, the upper end in the positions shown in the drawings, and the pivot pin **63** is threaded into and projects forwardly from the lower end portion of the bar to define a pivotal axis **70** spaced radially from axis **57** of the associated disk **55**.

As shown in FIG. 6, the rear or inner portions of each adjusting bar and the groove sidewalls are dovetail-shaped to mount the bar for back and forth sliding in the groove while holding the bar securely against forward movement out of the groove.

Each carrier **58** comprises a body of rectangular cross-section formed with a horizontal front-to-rear bore **71** through which the pivot pin **63** projects as shown in FIG. 4. Adjacent the front and rear ends of the bore are two anti-friction bearings **72** which pivotally mount the body on the pin. A nut **73** is threaded onto the front end of the pin to hold the carrier body on the pin. Thus, it will be seen that adjustment of the bar **64** along the groove **65** varies the spacing of the pin **63** and the pivotal axis **70** of the carrier from the axis **57** of the associated drive disk **55** to increase or decrease the diameter of the orbit of the carrier.

To maintain the carriers in the same attitude throughout their orbits, a guide rod **74** perpendicular to the planes of the webs **17** is telescoped at its opposite ends into two alined horizontal bores **75** (FIGS. 4 and 5) in projections **77** preferably integral with the carriers and offset rearwardly from the webs. The guide rod is fixed in one of the bores, the left one in this instance, and slides back and forth in the other to accommodate the back and forth movement of the carriers relative to each other during operation of the machine while holding the carriers in the attitudes shown in the drawings with the sealing bars **31** projecting horizontally toward each other at all times.

In order that the simple orbital motion of the carriers **58** about the axes **57** may be used to produce longitudinal motion of the sealing bars **31** along the webs **17** while the bars are pressed against opposite sides of the webs, the bars mounted on the carriers for reciprocating movement to yield relative to the carriers as the latter continue toward the webs after the sealing faces **33** engage the webs and are pressed tightly together. For this purpose, each sealing bar is mounted on the projecting end of an elongated horizontal rod **78** slidably guided in a bore **79** in the carrier. Coiled compression springs **80** acting between the carrier and the sealing bar urge the latter away from the carrier into an extended position (FIGS. 7, 8 and 9) and yield to permit the bar to move into a retracted position (FIG. 10) closer to the carriers. Herein, there are four springs **80** for each sealing bar, each spring being seated at one end in a recess **81** in the sealing bar and the other end into a bore **82** (see FIG. 6) in the carrier and abutting against a plug **83** closing the end of the bore remote from the sealing bar. The pivot pins **63** project through horizontally elongated slots **84** in the bars **78** intermediate the ends of the latter and abut against the ends of the slots as shown in FIGS. 8 through 10 to limit back and forth motion of the rods and the sealing bars relative to the carriers.

With this arrangement, rotation of the gears **62** and the disks **55** in opposite directions as indicated by the arrows in FIG. 7 swings the pins **63** and thus the carriers **58** about the disk axes **57** along circular orbits having radii determined by the adjustment of the bars **64** in the grooves **65** in the disks, moving the carriers from the starting positions shown in FIG. 8 first upwardly and toward the webs **17** and the filling spouts **21**, then arcuately downwardly along the webs, then farther downwardly and

away from the webs, and then back upwardly toward the starting positions. By proper positioning of the disks **55** and adjustment of the bars **64** relative to the disks, the lateral stroke of the two sealing units **30** is selected so that the sealing faces **33** engages the webs **17** at or near the highest point in the orbit of each unit, when one-half of the lateral stroke is completed and the carriers are about to begin to swing downwardly.

As shown in FIG. 9, the sealing faces **33** engage the webs **17** when the units **30** have swung through arcs *a* of approximately ninety degrees from the starting positions shown in FIG. 8. Then, as the units swing downwardly through the next ninety degrees of orbital motion, indicated at *b* in FIG. 10, the carriers **58** continue to move toward each other and the sealing bars **78** yield relative to the carriers thereby compressing the springs **80** to increase the pressure on the webs between the sealing faces. Thus, a pair of pockets **34** is formed in the webs around the filling spouts. Of course, the increased pressure is accompanied by downward movement of the sealing bars longitudinally of the webs to pull the newly formed pockets downwardly away from the spouts and draw fresh lengths of the webs over the spouts. The product may be dispensed through the spouts into the pockets at this time.

As the sealing units **30** continue through the next ninety degrees, indicated at *c*, and the pins **63** swing toward the the broken line positions in FIG. 10, pressure on the webs **17** gradually is relieved as the carriers **58** move away from each other and the springs **80** extend to urge the sealing bars outwardly toward their extended positions. This action of the springs, however, maintains the engagement of the sealing faces with the webs so that the units continue to pull the webs downwardly until the sealing bars are completely extended.

This occurs when the arc *c* is completed and the carriers being to swing upwardly through the remaining ninety degree arcs *d* from positions shown in broken lines in FIG. 10 back to the positions in FIG. 8. Thus, the carriers continue to swing away from the webs and pull the sealing faces **33** completely out of engagement with the webs and return to their starting positions shown in FIG. 8. During the next orbit or cycle, the faces **33** again engage the webs to form the next set of pockets **34** between the upper portions of the faces while the flat portions **40** close the upper ends of the preceding pair of pockets.

Because of the simplicity of the structure and the positive action of the sealing units **30**, the latter may be operated at a relatively high speed determined by the speed of rotation of the gears **62** and the disks **55**. Moreover, all that is required is a simple rotary drive for one of the shafts **59** such as a motor (not shown) for continuously rotating the shaft in one direction. Such continuous rotation of one shaft continuously operates both sealing units in timed relation with each other, and the continuous orbital motion of the sealing units intermittently advances the webs **17**.

To operate the cut-off device **43** in timed relation with the sealing units **30** and the advance of the webs **17**, two upright levers **85** are pivoted intermediate their ends on the base **20**, herein on shouldered screws **87** threaded into lugs **88** on the wings **49**, and are pivotally connected on opposite sides of the pivots to the carriers **58** and to the rods **47** supporting the cut-off members **44** and **45**. The pivotal connections between the levers and the rods comprise part cylindrical walls **89** formed on the lower ends of the levers and fitted in sockets **90** formed in the rods, while the pivotal connections between the upper end portions of the levers and the carriers are formed by rollers **91** journaled on the carriers and slidably received in longitudinal grooves **92** in the backs of the levers so that the upper pivots are movable longitudinally along the levers as the carriers move up and down.

Through this mechanism, the back and forth motion of the carriers **58** is transmitted to the cut-off members **44** and **45** which reciprocate back and forth in timed relation with the back and forth motion of the carriers but in opposite directions because the levers reverse the motion. Thus, as the pins **63** and the carriers move downwardly through the arcs *b* and *c* with the sealing bars **31** in engagement with the webs **17**, the knife **44** and the anvil **45** are retracted and spaced from the moving webs. As the pivot pins and the carriers move away from the webs during the arcs *c* and *d*, however, the cut-off elements move toward each other and the webs, engaging and severing the webs near the ends of the arcs *d* when the webs are stationary. Then, as the carriers swing back toward the webs through the initial arcs *a* preparatory to the indexing of the webs, the cut-off elements are being retracted.

From the foregoing, it will be seen that the sole support for the sealing units **30** may be the two rotating drive elements, herein, the disks **55**, which produce the desired motion of the sealing units to perform not only the sealing operation but also the web-feeding operation. By adjusting the position of the pivot pin **63** for the carriers relative to the disk axes **57**, the radii of the orbits of the carriers and thus the lengths of the webs drawn through the machine during each orbit may be varied. In addition, the same simple drive elements operate the cut-off device **43** in timed relation with the sealing units **30** to sever packages from the webs during dwell periods. The result is a machine that is extremely simple and compact in construction and relatively inexpensive to produce.

We claim as our invention:

1. In a machine for forming and filling packages, the combination of, a base; a vertical filling spout having an open lower end for dispensing the product to be packaged; means for guiding two elongated webs of heat seable material longitudinally along opposite sides of said spout and downwardly in opposed face-to-face relation past said open end; two sealing units disposed on opposite sides of said webs in starting positions level with said open end and each including a carrier, a sealing bar projecting horizontally from said carrier toward said webs and the opposing bar on the other unit, opposed sealing faces on said bars shaped to fit together around said spout and across said open end to seal the webs together and form an open-ended pocket in the webs, means mounting said sealing bars on said carriers for back and forth movement relative thereto toward the webs into extended positions and away from the webs into retracted positions, and springs urging said sealing bars toward said extended positions; two drive elements journaled on said base for rotation about parallel horizontal axes on opposite sides of said webs; means journaling each carrier on one of said elements for rotation relative thereto about a horizontal pivotal axis spaced radially from the axis of the element, means for maintaining said carriers in a preselected attitude with said bars projecting horizontally toward said webs whereby rotation of said elements in opposite directions from said starting positions swings said carriers through orbital paths first toward each other and to press said sealing faces against the webs and form a first pocket therein, then gradually closer together to shift said sealing bars toward their retracted positions while compressing said springs and moving said bars downwardly away from said spout to draw fresh lengths of the webs over the spout, then gradually away from the webs to permit said bars to return to their extended positions while continuing to move the bars downwardly in engagement with the webs, and finally away from the webs to withdraw said faces from engagement with the webs and swing said units upwardly to said starting positions preparatory to another orbit and the formation of a second pocket longitudinally spaced from said first pocket, means on said sealing faces for closing the open end of said first pocket as the units form said second pocket, a cut-off device below said sealing units comprising a pair of cut-off members mounted on

said base on opposite sides of said webs for back and forth horizontal movement toward and away from each other to sever said webs between successive closed pockets, and mechanism for operating said cut-off device in timed relation with said sealing units comprising a pair of upright levers disposed on opposite sides of said webs, each lever being pivoted intermediate its ends on said base between the cut-off member and the sealing unit on the same side of the webs for rocking of the ends of the lever toward and away from the webs, a first pivotal connection between the cut-off member and the lower end of the lever, and a second pivotal connection between the sealing unit and the upper end of the lever, said second pivotal connection being movable longitudinally along said lever to accommodate vertical movement of said sealing unit while transmitting the horizontal movement of the unit to the cut-off member.

2. In a machine for forming and filling packages, the combination of, a base, a filling spout having an open end for dispensing the product to be packaged, means for guiding two elongated webs of heat sealable material longitudinally along opposite sides of said spout and in opposed face-to-face relation past said open end, two sealing units disposed on opposite sides of said webs and each having carrier and a sealing bar projecting from said carrier toward said webs and opposing the bar on the other unit, said bars being mounted on said carriers for back and forth motion relative thereto between extended and retracted positions and having opposed sealing faces shaped to fit together around said spout and across said open end to seal the webs together between said faces and form an open-ended pocket in the webs, mechanism for imparting orbital motions to said carriers and thereby moving said bars toward each other and against said webs to form a

first pocket around said spout, then longitudinally of the webs away from said spout to draw the pocket away from the spout while drawing fresh lengths of the webs over the spout, and then away from the webs and back to their original positions preparatory to another orbit and the formation of a second pocket longitudinally spaced from said first pocket, means on said sealing faces for closing and sealing the open end of said first pocket as the units form said second pocket, a cut-off device mounted on said base and including two members disposed on opposite sides of said webs and engageable with the webs between successive pockets to sever the webs, at least one of said members being supported for back and forth reciprocation toward and away from the webs, and means for transmitting the back and forth motion of one of said carriers to said one member to reciprocate the latter back and forth in timed relation with said sealing units.

References Cited

UNITED STATES PATENTS

2,606,412	8/1952	Salfisberg	53—180 X
2,950,588	8/1960	Gausman	53—28 X
2,978,853	4/1961	Price	53—178
3,055,154	9/1962	Markley et al.	53—182
3,074,214	1/1963	Schneider et al.	53—180

FOREIGN PATENTS

491,372	3/1953	Canada.

TRAVIS S. McGEHEE, *Primary Examiner.*

FRANK E. BAILEY, *Examiner.*

N. ABRAMS, *Assistant Examiner.*