

June 11, 1968

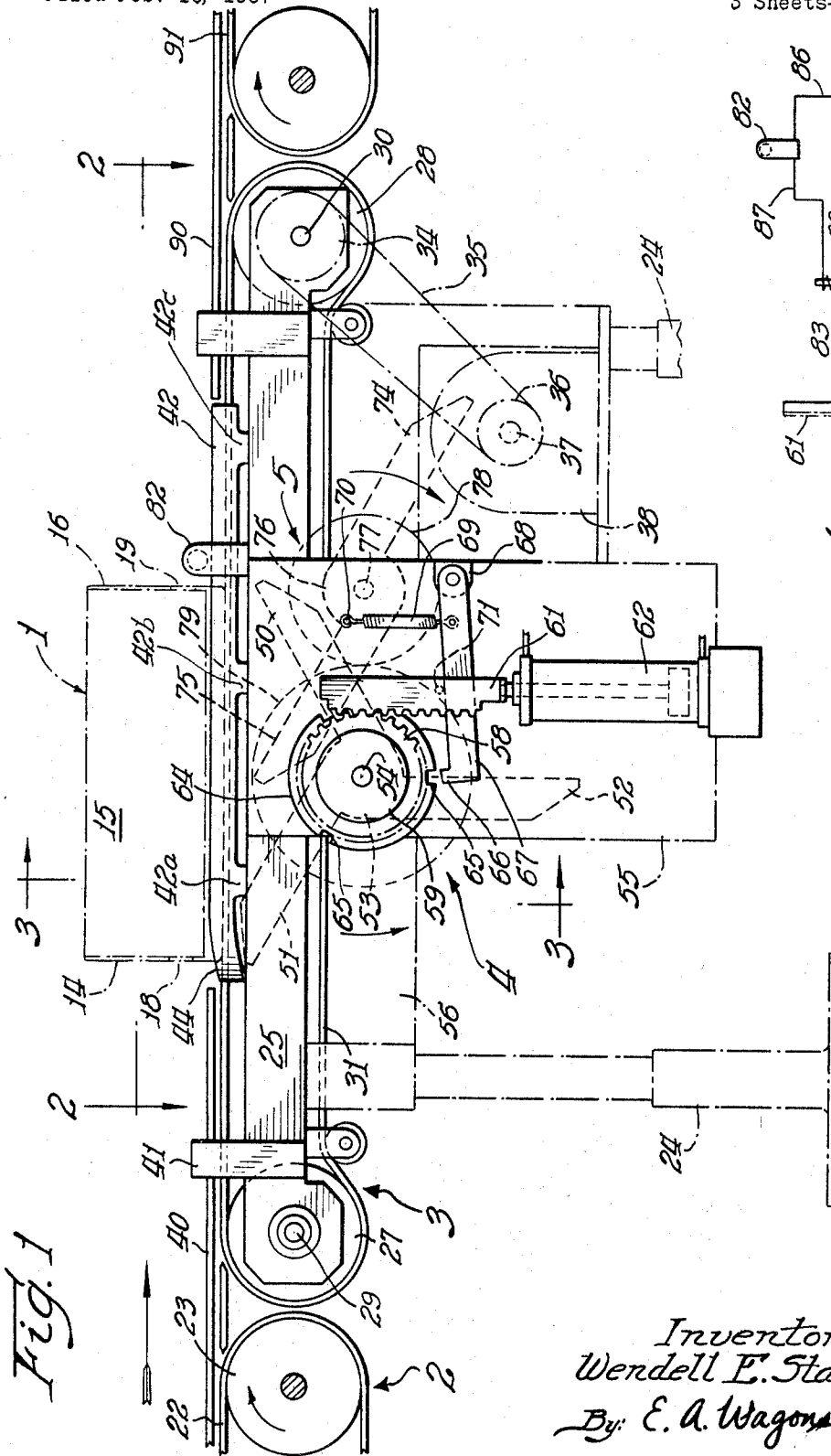
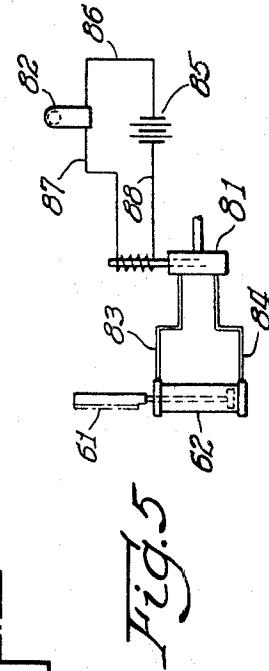
W. E. STANDLEY

3,387,522

STRAIGHT LINE FLAP SLITTER

Filed Feb. 16, 1967

3 Sheets-Sheet 1



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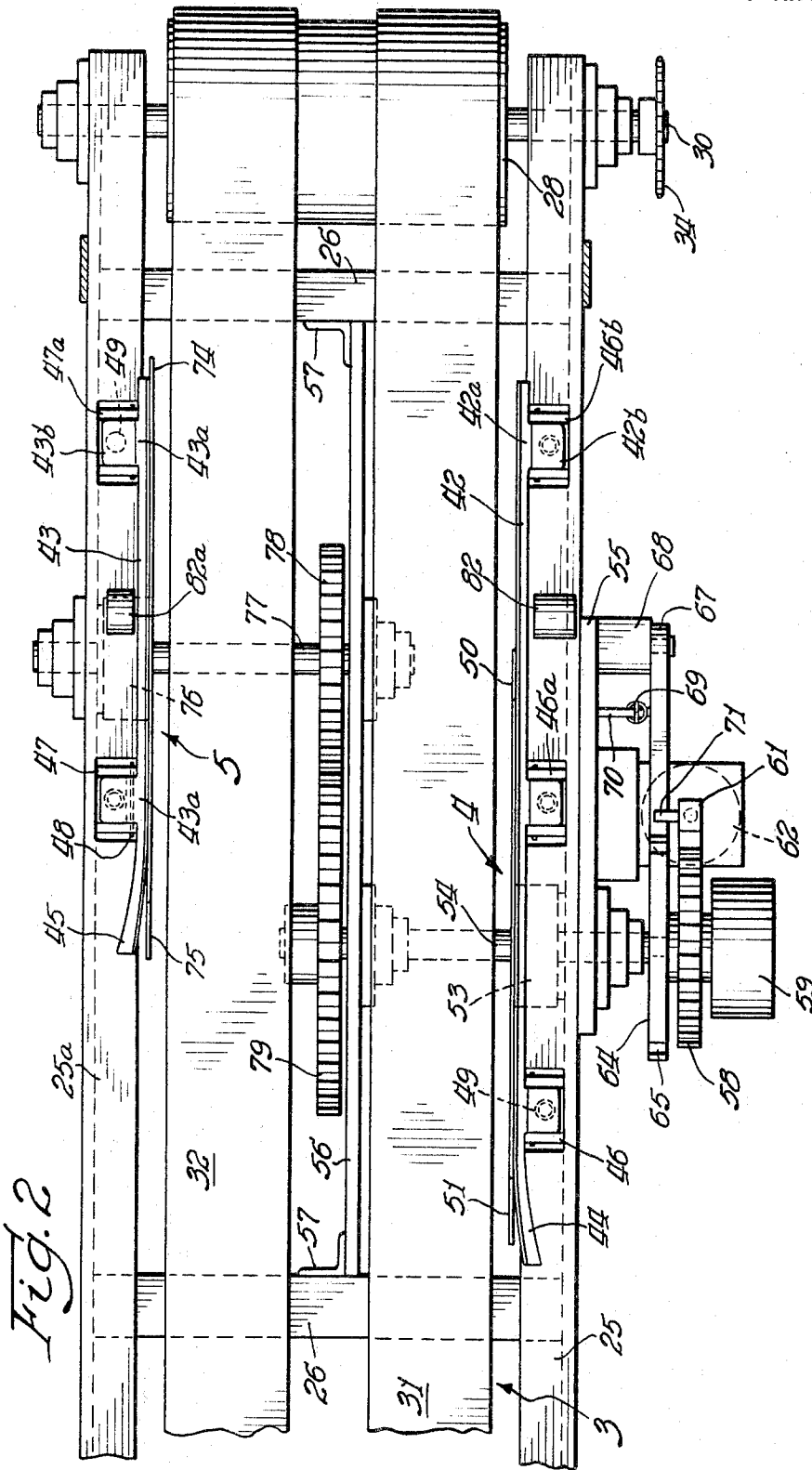
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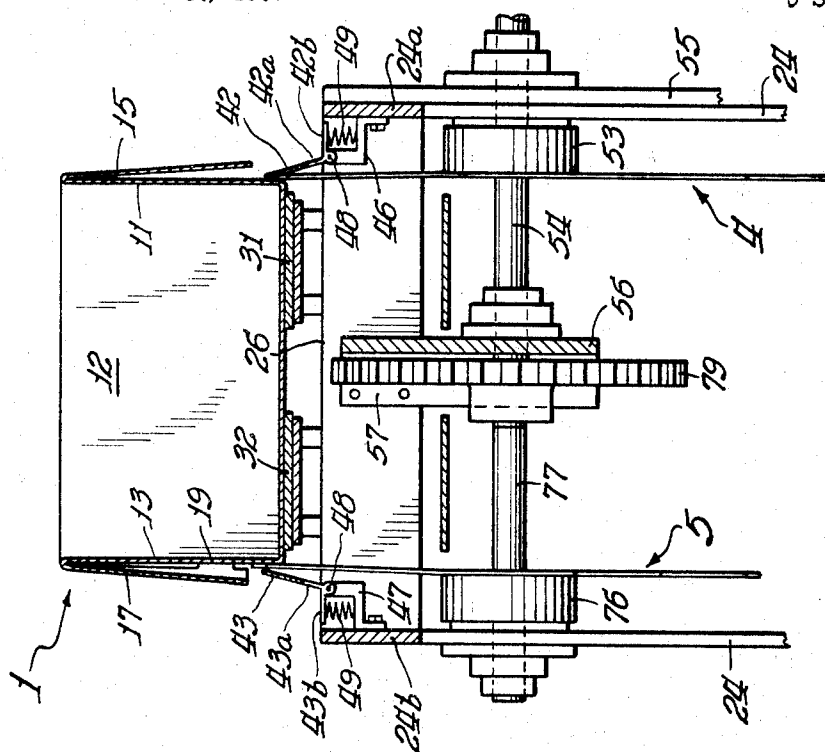


Fig. 3

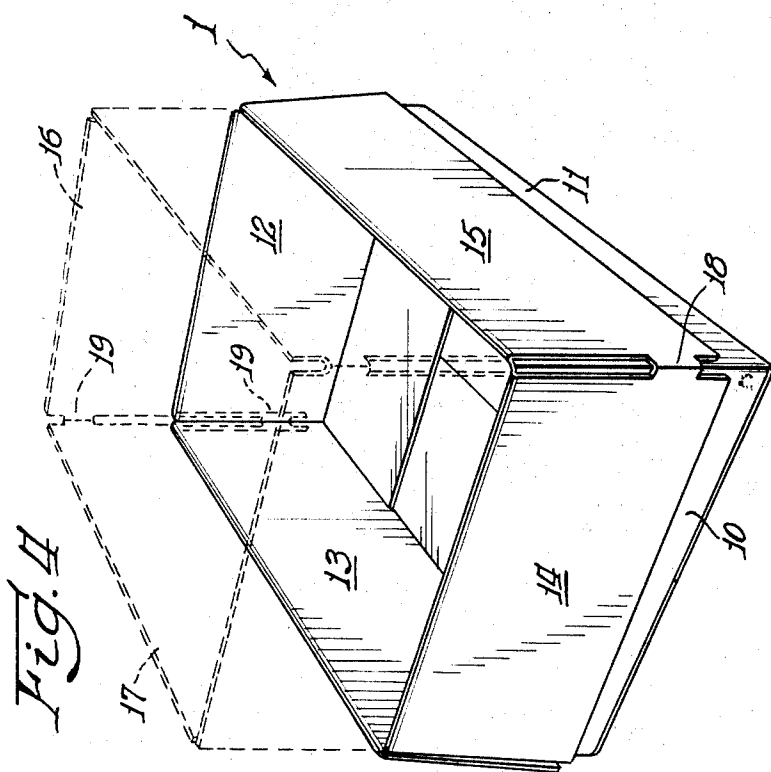


Fig. 4

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STRAIGHT LINE FLAP SLITTER

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ABSTRACT OF THE DISCLOSURE

The mechanism herein disclosed is employed to sever the corner connecting strips between the edges of downturned closure flaps which are held along the outer surfaces of the vertical walls of a paperboard case while the case is advanced in a straight line. Two rotary blade members are located at the opposite sides of and below the case path. During the advance of the case the blade members are simultaneously actuated to sever the strips at opposite corners.

The present invention is in the nature of an improvement of the invention disclosed in copending application, Ser. No. 478,371, filed Aug. 9, 1965.

In certain case loading operations it is desirable to retain the top closure flaps close to the sides and ends of the paper-board cases instead of allowing them to extend outwardly as would normally be true if the flaps were not retained. One expedient that is employed is to make up the case blank so as to leave short, integral holding strips at opposite corners of the case when the case has been set up in expanded, tubular form. These holding strips or connections join a side wall cover flap and an end wall cover flap at diagonally opposite corners of the case. In setting up this form of case the two pairs of joined flaps are first folded against their attached side and end walls while the case is in collapsed, tubular condition. The case is then expanded to its open, tubular form, and the opposite pairs of cover flaps, being connected at diagonally opposite corners, will be retained in close relation to their attached walls. The bottom closure flaps may be folded into bottom-closing position and secured in the usual way, thus preparing the case to receive its contents, such as cans or bottles.

After the cases are filled the strips connecting the cover flaps are severed and the cover flaps will be swung into closed position and secured in a usual manner.

An important object of the invention is to provide an effective and improved form of mechanism for severing the strips connecting the cover flaps of a filled paper-board case.

Another object of the invention is to provide an improved flap slitting mechanism for severing the flap connections during the course of travel of the case along conveying means.

Another object of the invention is to provide slitting mechanism operative to sever the flap connections while the case is being conveyed a minimum distance along a straight line path.

A further object of the invention is to provide slitting mechanism in which the diagonally opposite flap connections are severed at substantially the same time or in close sequence, whereby the distance of travel of the case, while the flap connections are being severed, is minimized.

A further object of the invention is to provide oppositely acting blade means for severing the flap connections simultaneously at diagonally opposite corners of a case, thus eliminating the need for special means for retention of the case during the severing operation.

Additional and more specific objects and advantages

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of the present invention will become apparent as the description proceeds.

In the drawings—

FIGURE 1 is a side elevational view of the device;

FIGURE 2 is a plan view, on an enlarged scale, of a major portion of the device shown in FIGURE 1;

FIGURE 3 is a vertical sectional view taken on line 3—3 of FIGURE 1, except that the cutting blades are shown in different positions;

FIGURE 4 is a perspective view of a form of case upon which the mechanism is designed to operate; and

FIGURE 5 is a wiring diagram illustrating the control means for the cutting blades.

The mechanism herein disclosed is designed to be incorporated within usual or standard production lines and includes a conveyor to advance cases that have already been loaded with goods so that the cases are ready to be treated by machines which secure the top closure flaps. The cases will have their closure flaps held in outwardly downfolded positions, the flaps, in the present instance, being shown as held by short, integral connecting strips.

The cases are preferable delivered from a feed conveyor to an accelerating conveyor to space them and, while on the latter conveyor, they pass cutting stations at which swingable or rotary knives or blades cut the flap connections. The blades are preferably operated intermittently and may be controlled by switch means operated by the case as it advances.

Referring more particularly to the drawings, the cases, generally indicated at 1, are delivered in end-to-end relation on an infeed conveyor means 2 to a main conveyor means 3. Swingable or rotary blade means, indicated as a whole at 4, is located at one side of the case path to sever the flap connecting strip at the trailing end of the case, and a second blade means, indicated as a whole at 5, is located on the opposite side of the case path to sever the flap connecting strip at the leading end of the case.

The case 1 may be in the form of a single-blank, regular-slotted, paperboard container secured at the box factory in collapsed, tubular form. The case comprises four interconnected side and end walls 10, 11, 12 and 13. Cover flaps 14, 15, 16 and 17 are hinged respectively to walls 10, 11, 12 and 13. The cover flaps, as herein shown, are connected with integral sections between flaps 14 and 15, as indicated at 18, and between flaps 16 and 17, as indicated at 19. By first folding the aligned flaps 14 and 15 and the aligned flaps 16 and 17 against their attached walls before expanding the case, the case may then be expanded as shown and the connected flaps will be retained in close relation to their attached walls. The bottom flaps may then be secured and the case is then ready to receive its contents. It is to be noted that the free vertical edges of flaps 15 and 16 will tend to flare slightly outward at one corner of the case and the free vertical edges of flaps 14 and 17 will flare outward at the opposite corner. The vertical extent of the flaps is such that their lower edges will terminate above the lower edges of their attached walls.

The infeed conveyor may be of any desired length and includes a belt means 22 passing around a head roll 23 which is rotated by suitable drive means. Cases advancing on belt means 22 will preferably be in end-to-end abutted relation.

The main conveyor 3 is supported on a suitable base frame including vertical and horizontal members, as indicated at 24, 25, 25a and 26. Tail and head rolls 27 and 28 are supported on shafts 29 and 30 respectively journaled in the longitudinal frame members 25. A pair of laterally spaced endless belts 31, 32 pass around the rolls 27 and 28.

Shaft 30 on which the belt roll 28 is keyed has a sprocket 34 fixed thereon which may be driven by a sprocket

chain 35 passing over a sprocket 36 on shaft 37 of a motor 38. The drive ratio is preferably such that belts 31, 32 will move at a speed in excess of the speed of belt 22 to cause spacing of the cases fed onto the belts 31, 32.

The cases delivered onto the belts 31, 32 may be guided by guide rails 40 secured to upright brackets 41. At the strip severing station the cases, as best shown in FIGURE 3, are received between inwardly inclined guide rails 42 and 43 which are preferably hingedly mounted on the machine frame and also are spring-loaded to urge their upper edge portions inwardly to cause them to engage the adjacent case walls. The receiving ends of the guide rails 42 and 43 are flared outward, as indicated at 44 and 45 (see FIGURE 2), and the height of the rails is such that their upper edges are below the lower edges of the side wall flaps so that the guide rails will remain clear of the flaps as the case enters between the guide rails.

The rail 42, as best shown in FIGURE 2, is supported on U-shaped, angle brackets 46, 46a and 46b secured to vertically disposed web or frame section 24a. See FIGURE 3. In a similar manner rail 43 is supported on brackets 47 and 47a secured to a vertical web or frame section 24b. The rail 43 is preferably located farther downstream than rail 42 for a purpose which will be clear as the description proceeds.

The construction of the U-shaped brackets and the manner of supporting the rails thereon may be identical for each bracket and a detailed description of one of these constructions will suffice. As shown in FIGURES 1, 2 and 3, at each supporting bracket the two rails 42 and 43 are each formed with portions extending downwardly and then outwardly, as indicated at 42a and 42b for rail 42, and at 43a and 43b for rail 43. Referring particularly to FIGURES 2 and 3, at the angle between the downwardly and outwardly extending portions there is formed a boss to receive a hinge pin 48 which is supported at its ends in the opposite sides or prongs of the U-shaped bracket. A coil spring 49 is arranged beneath each laterally extending portion 42b and 43b to exert upward pressure on such laterally extending portion to urge the guide rails to swing inwardly toward the case side walls.

As shown in the drawings, it may be observed that when a case, such as illustrated in FIGURE 4, is advanced along conveyor 3, the unconnected, or free, vertical edge of side flap 15 will be in leading position with the connected end trailing and the lower edge of flap 15 will be above and clear of the guide rail 42. At the other side of the case, the flap 17 will move in a path free of the guide rail 43 and the end of flap 17 connected with the flap 16 will be in a leading position, with the unconnected end of flap 17 in trailing position.

The preferred manner of severing the connecting sections or strips is to locate the movable cutting blades so they will be in close relation to the guide rails 42 and 43 as the case is brought into strip-severing position. As soon as the case is in the desired position the blades preferably are actuated to swing in opposite directions against the connecting strips 18 and 19 so that both strips are severed at the same time.

First referring to the severing means 4 for the connecting strip 18 at the trailing end of the case, a rotary blade member is preferably provided for this purpose. This may comprise a unit having three radially extending blades 50, 51 and 52 secured on a block or collar element 53 which is keyed on a shaft 54. The shaft 54 is journaled at its outer end in a depending frame plate 55, secured on longitudinal frame member 25. At its opposite end, the shaft 54 is journaled in a second depending frame plate 56, secured by brackets 57, 57 to transverse frame members 26, 26.

Means are provided for rotating the shaft 54 step-by-step in a counterclockwise direction, as viewed in FIGURE 1. For this purpose a spur gear 58 is mounted for free rotation in a clockwise direction on the shaft 54 and is designed to be clutch-connected to the shaft by means of suitable mechanism within the clutch housing 59 when the gear 58

is rotated counterclockwise. The details of this conventional type of mechanism are well known.

A rack element 61, meshing with the spur gear 58, is operated by a piston and piston rod moving within cylinder 62. As this piston rod is extended to move the rack upward, the shaft 54 is rotated one step.

A disk element 64, keyed on shaft 54 to rotate therewith, is formed with three equi-spaced peripheral notches 65, 65 into which may be received a detent 66, formed on the free end of an arm 67, pivotally mounted on a pin held within a bracket 68, secured on the depending plate 55. The arm is urged to swing upwardly by a coil spring 69, having one end secured on the end of a stud 70 threaded into the plate 55. A laterally extending pin 71 is provided on the side of rack 61 to engage and force the arm 67 downward out of its engaged notch each time after the rack has been moved to its downwardly retracted position.

Upon upward movement of the rack, the detent 66 swings upward by action of the spring 69 to engage the peripheral face of the disk 64 while the disk is rotating and then enters the next notch 65 after the rack has rotated the shaft 54 through 120° by means of the spur gear 58 clutch-connected to the shaft.

By means of the mechanism just described, the blades 51, 52 and 53 will be rotated approximately 120° each time the rack 61 has been upwardly extended. When the disk 64 is brought to a stop by detent 66 entering a notch 65, the blade that has just severed the connecting strip 18, herein shown as blade 51, will be stopped below the path of the bottom of the case and the following blade shown at 50, will also be stopped below such path. See FIGURE 1. While the blades in the present instance are stopped below the case path, it may be noted that the principal consideration is to retain the blade, that is to cut the strip on the next following case, out of the path of the strip.

The severing means 5 for the connecting strip 19 at the leading end of the case, as herein shown, preferably is in the form of a two-blade unit comprising blades 74 and 75, generally comparable to blades 50, 51 and 52, secured on a block or collar 76 which is keyed on a shaft 77. One end of shaft 77 is journaled in the vertical frame member 24 and the other end in the depending plate 56.

The severing units are preferably arranged to sever the leading and trailing flap-connecting strips simultaneously and for this purpose a spur gear 78 on shaft 77 meshes with a spur gear 79 on shaft 54 from which the shaft 77 is driven. The drive ratio is such that, for 120° of rotation of shaft 54, the shaft 77 will rotate 180°. It is to be noted further that the rotation of shaft 77 is opposite to that of shaft 54.

The cutting blades may be formed from thin sheet steel or other suitable material and, preferably, are somewhat flexible so that the end portion of the blades may be deflected. As best illustrated in FIGURE 3, the normal plane of movement of the blades is preferably such that such plane will intersect the normally inclined guide rails between the upper and lower edges of the rails. As the case moves in between the guide rails the blade ends nearest the case are preferably below the level of the bottom of the case and the upper edge portions of the guide rails will either be in contact with or will be closely adjacent the lateral walls of the case. When the case is in the desired position for cutting the connecting strips the blades are rotated. The tips of the blades at each side of the case swing up and will first engage the flat, inclined surfaces of the guide rails. The inward pressure of the guide rails tends to deflect the free end portions of the blades, causing them to swing along close to or in sliding contact with the case walls. See FIGURE 3. The guide rails thus serve as guide means for the blades as well as for the cases. As the blades complete their swing their cutting edges contact and completely sever the flap connections 18 and 19. The blades, after completing their cuts, are stopped, as previously stated, in positions to

be clear of the walls and bottom of the next oncoming case.

As above brought out, the blades will come to a stop when the detent on arm 67 enters one of the notches 65 of the disk 64. Following this, the rack 61 is retracted downwardly and, since the clutch acts only during the upward movement of the rack, only the spur gear member 64 is rotated. Completion of the downward movement of the rack 61 causes pin 71 to swing the arm 67 and to withdraw the detent 66 from the notch 65. The mechanism is then ready for the next upward movement of the rack to actuate the blades when the next case arrives in the desired position.

The connecting strips between the case flaps may, if desired, be severed while the case is at rest, but it is preferred to sever the strips while the case is in motion. For this purpose the operation may be automatically effected by a suitable switch means actuated by the case. As herein shown, photocell switch units 82, 82a are located on the machine frame with its light beam crossing the case path. As indicated in FIGURE 5, a suitable solenoid valve 81 controls the flow of fluid pressure to cylinder 62 through conduits 83 and 84. Electric current from source 85 flows to the photocell unit and to the solenoid coil through conductors 86, 87 and 88. The solenoid valve may be of conventional form and of the type in which fluid pressure is admitted below the piston upon actuation of the switch 82 following initial interruption of the light beam. The solenoid switch may be automatically reversed to retract the rack 61 after a brief time interval. The particular construction of the switch means and the solenoid valve for controlling flow of pressure fluid into and out of the cylinder 62 forms no part of the invention and may be varied as desired.

As viewed in FIGURE 1, the photocell switch will be actuated after the case has advanced a short distance and the blades will strike the strip connections after a short additional advance of the case. The location of the photocell unit may be altered, dependent upon the speed of movement of the blades and speed of travel of the case.

The method of severing the connecting strips between joined flaps on cases, as herein described, may be summarized by stating that such method comprises locating a case in position at a strip-severing station and simultaneously striking each connecting strip with a separate severing blade, each of which is moving oppositely to the other. In this action each blade will apply substantially equal components of force upon the case either of which would tend to displace the case in directions away from the blades, all dependent, of course, upon the resistance of the strips to being severed, the degree of sharpness of the blades and the weight of the case. The case, as shown in the drawing, is free to move endwise in either direction. However, by the joint action of the severing blades, the position of the case, during the very short interval required in the severing process, is substantially unaffected by either blade. Each blade thus acts as a case retaining means for the other.

After the case flaps have been released by severing the connecting strips the case will pass between guide rails 90 onto an off-bearing conveyor belt 91, preparatory to swinging the flaps to closed position and securing them.

From the foregoing it is apparent that the present invention provides a simple arrangement for separating an advancing row of end-to-end abutted cases with downwardly folded side and end flaps held by connecting strips. As the cases advance in separated relation they are carried to the cutting station where oppositely acting blades are provided. The advancing case actuates switch means causing the blades to operate simultaneously. The blades for severing the strips are guided into accurate cutting position by the inwardly urged guide rails which hold the case in a path which is clear of the normal path of the blades. Further, the blades, after each severing operation, are brought to rest out of the path of the next advancing case and are moved into their operating positions

after the case is brought in between and accurately positioned by the inwardly inclined, spring-loaded guide rails.

It is to be understood that the mechanism of the present invention is not limited to severing the flap connecting strips while the case is positioned lengthwise on a conveyor, nor is it limited to strip severing mechanism located beneath the case. It is therefore desired that references to vertical and horizontal relationships between the various parts referred to be understood as employed in a relative and not limiting sense.

While the present description sets forth a preferred embodiment of the invention, numerous changes may be made in the mechanism as disclosed without departing from the spirit of the invention, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

I claim:

1. A mechanism for severing the holding means between the adjacent edges of the hinged cover flaps of a resilient paperboard case on which the outwardly downturned cover flaps at diagonally opposite, vertical corners of an expanded case are held along their meeting edges by short connecting strips so that the connected edges of the cover flaps will be caused to remain in close relation to the respective attached case walls, and the opposite, unconnected vertical edges of the flaps will flare somewhat away from their attached walls, such mechanism comprising

a connecting-strip severing-station for receiving a case, a strip severing device at said station disposed adjacent the lower edge of a vertical wall of the case, said strip severing device comprising a movable blade element, and means for actuating such blade element to sever the connecting strip.

2. The invention as defined in claim 1 which includes a second strip severing device at said station disposed adjacent the opposite edge of the case, said second strip severing device comprising a movable blade element, and means for actuating both said blade elements simultaneously and in opposite direction to sever the respective connecting strips at diagonally opposite vertical corners of the case.

3. The invention as defined in claim 1 which includes guide means at said strip severing station for positioning a case, said guide means comprising an elongated narrow rail extending along an edge of the vertical case wall with its lower edge spaced outwardly of the plane of the case wall, said rail being inclined inwardly toward the case wall and having its upper edge in close relation thereto, said movable blade element being mounted for arcuate movement in a vertical path between the case wall and the lower edge of the guide rail, whereby the inclined surface of the guide rail serves to guide the free end of the blade element along in close relation to the case wall.

4. The invention as defined in claim 1 which includes a conveying means for advancing a case to the strip severing station, switch means for said station, and means cooperating with the switch means and the blade actuating means for effecting actuation of the blade to cut the strip when the case has been advanced to a predetermined position.

5. The invention as defined in claim 1 in which the movable blade element comprises a thin blade having a deflectable severing portion, means for mounting the blade for movement normally in a path generally parallel to but spaced somewhat outwardly of the adjacent vertical case wall, and means for inwardly deflecting the severing portion

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of the blade, whereby it will move in a path close to the case wall.

6. The invention as defined in claim 1 in which the movable blade element comprises at least one thin blade having a deflectable severing portion, means for mounting the blade for arcuate movement normally in a plane generally parallel to but spaced somewhat outwardly of the plane of the adjacent vertical case wall, and means for deflecting the severing portion of the blade, whereby it will move in a path close to the case wall.

7. The invention as defined in claim 1 which includes a conveying means for advancing a case to the strip severing station, the movable blade element comprising at least one radially extending blade, means for mounting the blade element for intermittent rotary movement about an axis spaced below the case path, drive means for rotating the blade element, stop means for bringing rotation of the blade element to a stop after each severing operation and with the blade disposed below the level of the severed connecting strip, and means for releasing the blade element from retention by the stop means following each operation of the blade element.

8. The invention defined in claim 1 which includes a conveying means for advancing a case to the strip severing station, the movable blade element comprising three radially extending, approximately symmetrically spaced blades, means for mounting the blades for intermittent rotary movement about an axis spaced below the case path, drive means for rotating the blade element in steps of approximately 120°,

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stop means for bringing the rotation of the blade element to a stop after each 120° of rotation, said stop means being arranged to stop each successive severing blade below the level of the severed connecting strip, and means for releasing the blade element from retention by the stop means following each partial rotation of the blade element.

9. The invention as defined in claim 1 which includes a conveying means for advancing a case to the strip severing station, the movable blade element comprising radially extending, oppositely related blades, means for mounting the blades for intermittent rotary movement about an axis spaced below the case path, drive means for rotating the blade element in steps of approximately 180°, stop means for bringing the rotation of the blade element to a stop after each 180° of rotation, said stop means being arranged to stop each successive severing blade below the level of the severed connecting strip, and means for releasing the blade element from retention by the stop means following each partial revolution of the blade element.

10. The invention as defined in claim 3 in which the lower portion of the elongated, narrow rail is pivotally supported, and means is provided for urging the upper edge of the rail toward the case wall.

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