Feb. 25, 1964 T. E. FORD ETAL 3,122,292

WEB FEED AND SEVERING DEVICE

Filed June 22, 1961 3 Sheets-Sheet 1

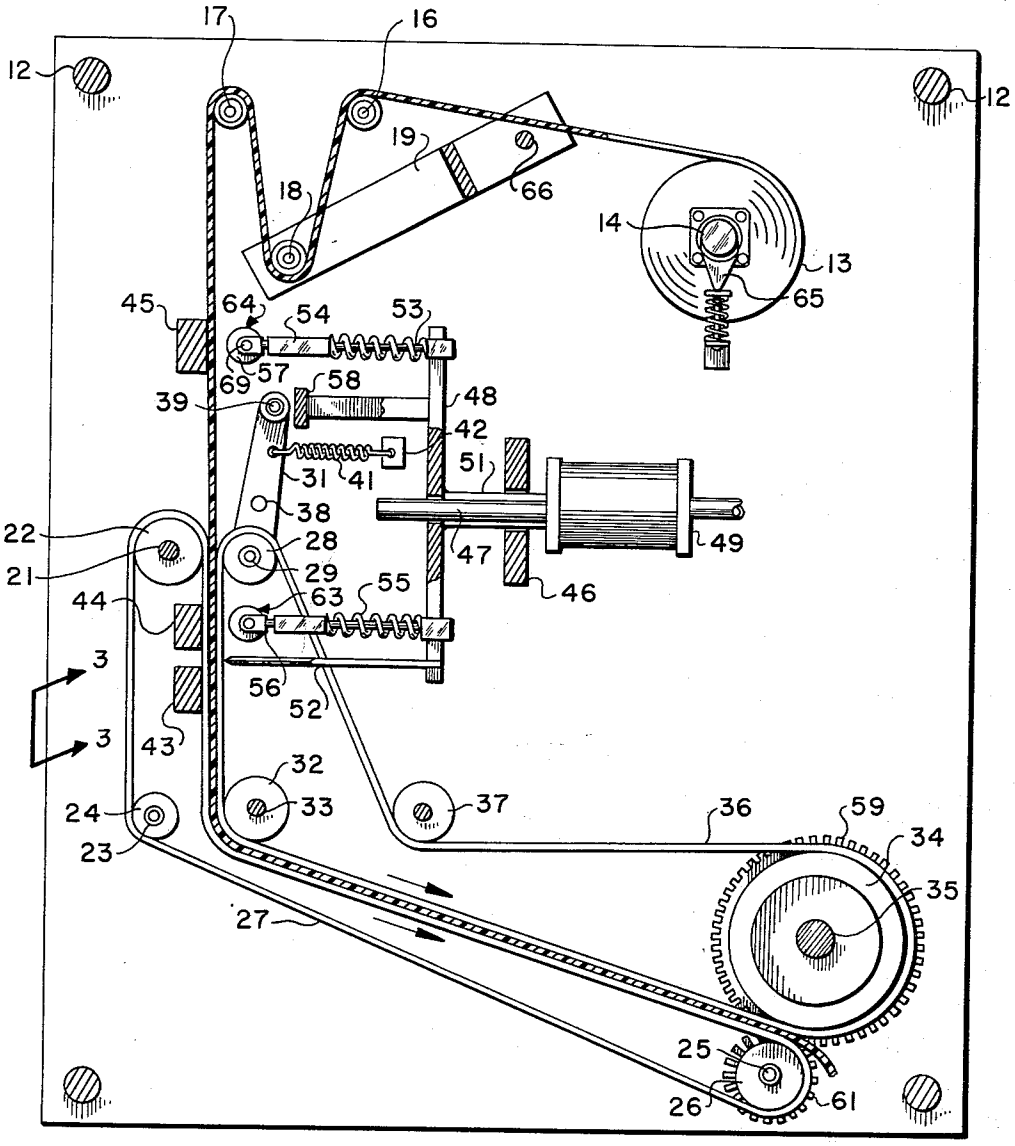


FIG. 1

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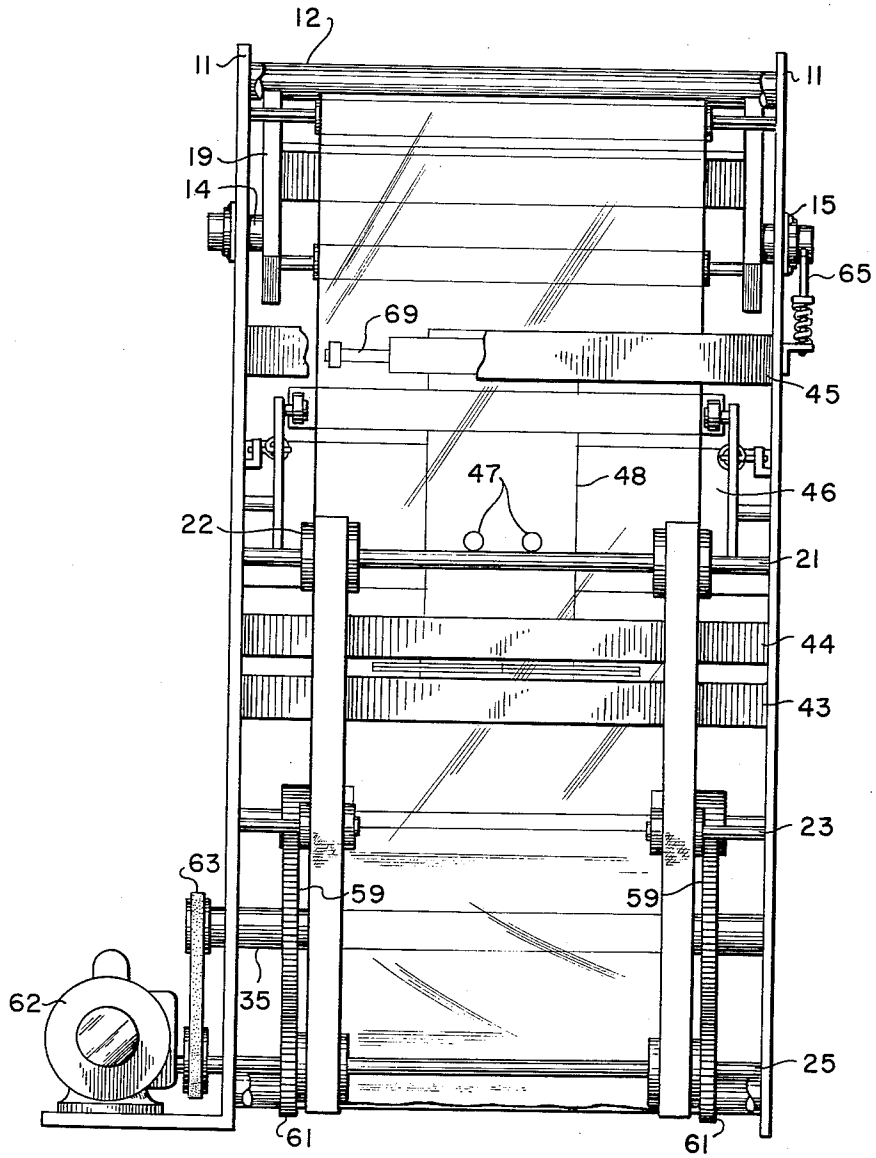


FIG. 2

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WEB FEED AND SEVERING DEVICE

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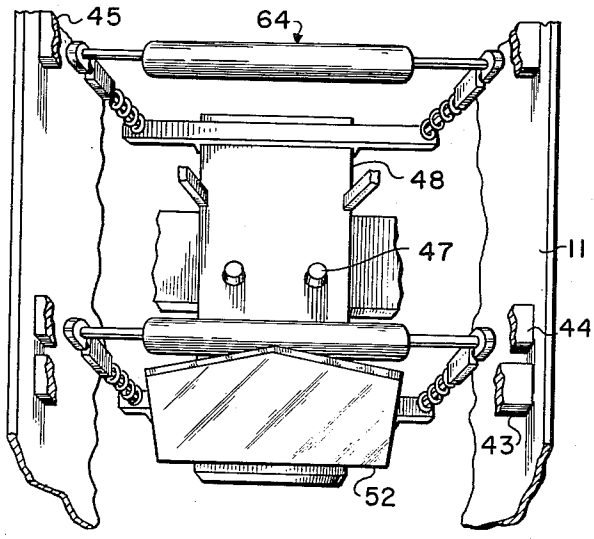


FIG. 3

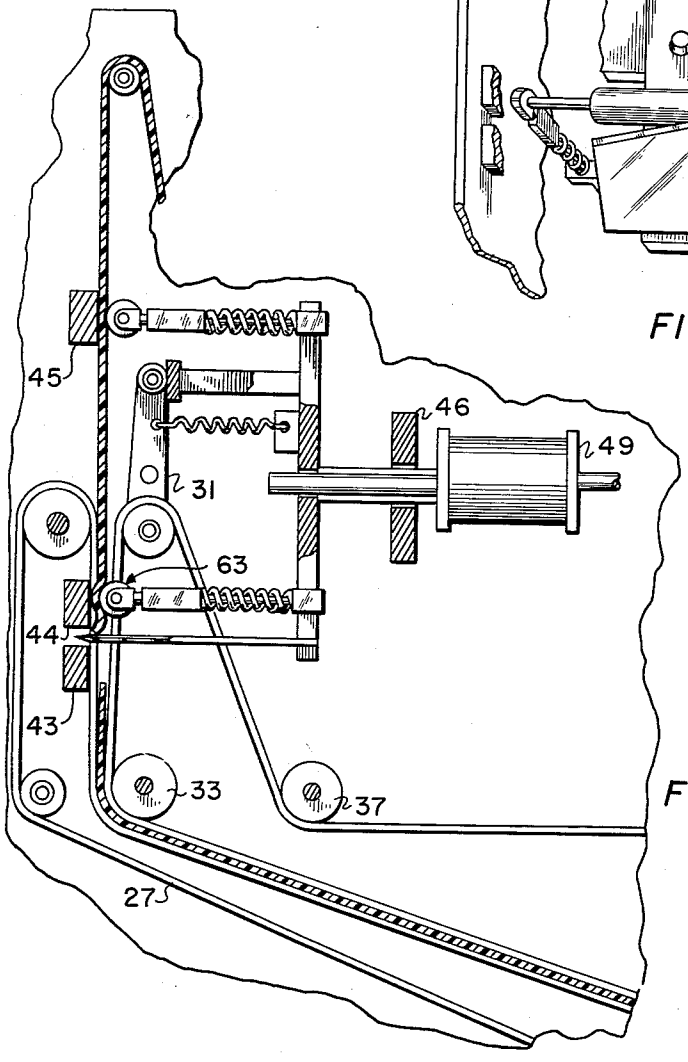


FIG. 4

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3,122,292

WEB FEED AND SEVERING DEVICE

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8 Claims. (Cl. 225—2)

This invention relates to web feed and severing devices and more particularly to a mechanism suitable for cutting webs of thin, flexible materials into units of predetermined length.

Specifically, this invention concerns a mechanism that feeds a web of thin, flexible, unsupported material past a cutting device which makes a partial transverse slice in the web. The partially severed length is then forcefully pulled apart from the remainder of the web and carried to a delivery point.

Up to the present time, all attempts to sever lengths of limp material from a web at high speeds have been unsuccessful or only partially successful. In prior art severing and sheeting mechanisms, it has been necessary to push the web across or through the cutting area. It is obvious that in dealing with limp materials it would be extremely difficult, if not impossible, to push a web of such material since the very limpness of the material would cause it to pile up rather than be pushed ahead. Because limp materials, such as polyethylene, polypropylene, polyvinyl chloride, rubber hydrochloride, and saran (copolymer of vinylidene chloride and vinyl chloride) films, are used to such a great extent in packaging, there is a need for a machine that will sever such materials into suitable lengths quickly, automatically and uniformly.

It is an object of the present invention to provide a mechanism for cutting flexible, limp web material into units of a predetermined length.

Another object is to provide a mechanism that will completely support and positively control and feed a web of limp material past a cutting device.

It is also an object to provide a means for placing the web under tension prior to cutting.

A further object is to provide a mechanism that will feed a web of limp material past a cutting device which will partially sever the web and which will subsequently tear the partially severed portion away from the remainder of the web.

These and other objects and features of novelty will be apparent from the following detailed description when read in connection with the accompanying drawings in which one embodiment of the invention is illustrated by way of example.

In the drawings:

FIGURE 1 is a side elevational sectional view of the apparatus of this invention with the cutting blade and associated mechanism shown in a retracted or non-cutting position.

FIGURE 2 is a front elevational view of the apparatus of FIGURE 1.

FIGURE 3 is a fragmentary perspective view looking in the direction of lines 3—3 of FIGURE 1.

FIGURE 4 is a fragmentary side elevational view in section of the apparatus of FIGURE 1 with the cutting blade and associated mechanism shown in a cutting position.

As shown in the drawings, the novel web severing and feed mechanism is housed within a frame which consists of two parallel and opposed frame side walls 11 spaced apart and held in a fixed position with relation to each other by a number of strategically located tie rods 12.

A roll of limp, plastic film 13, e.g., irradiated, biaxially oriented polyethylene, the preparation of which is disclosed in British Patent Nos. 866,820; 866,821; 866,822, having a thickness of 1 mil, is mounted upon a supply roll spindle 14 which is seated at both ends in journal blocks 15 located on each of the frame side walls.

To prevent the roll of film from overrunning itself when the unwinding force has been interrupted, a braking force is applied to the roll which is sufficient to stop the roll. A suitable brake is shown in FIGURES 1 and 2 and consists of a spring biased brake shoe 65 which is urged against the supply roll spindle 14.

The web is drawn from the supply roll and fed over a first idler roll 16 and then over a second idler roll 17, both of which are journaled in bearings located on the frame side walls. Between the first and second idler rolls, there is located a tensioning roll 18 which bears upon the web. The tensioning roll is rotatably mounted on the ends of two lever arms 19, which are in turn pivotally mounted to the frame side walls by pivot pins 66. The weight of the pivotally suspended tensioning roll provides the necessary amount of tension to the web.

A conveyor belt assembly consisting of two pairs of narrow conveyor belts is mounted between the frame side walls. The film web is gripped by the converging and contacting surfaces of each pair of belts which draw the web from the supply roll and carry the web past the cutting device.

A shaft 21 extending between and rotatably mounted on the frame side walls beneath the second idler roll carries a first pair of pulleys 22, which are spaced a fixed distance apart on the shaft. A second pair of pulleys 24 is rotatably mounted on separate short rods 23, each of which is rigidly secured to a frame side wall. This second pair of pulleys is located a short distance below and directly under the first pair of pulleys. A third pair of pulleys 26 is similarly mounted on separate short rods 25 which are fastened to the frame side walls. The latter pair of pulleys is located below and to the rear of the second pair of pulleys. As can be seen in FIGURE 1, three pulleys, one from each of the above three pairs, are encircled by an endless conveyor belt 27. The other three pulleys are similarly encircled.

Positioned directly behind the first pair of pulleys and also below the second idler roll is a fourth pair of pulleys 28 which is freely turnable on short shafts 29 rigidly mounted on pivoted lever arms 31. A fifth pair of pulleys 32 is placed directly behind the second pair of pulleys and is mounted on a shaft 33 which is rotatable in bushings located on opposite sides of the frame side walls. A sixth pair of pulleys 34 located just above the third pair of pulleys is mounted on a shaft 35 which is rotatably mounted on opposite sides of the frame side walls. Three pulleys, one from each of pairs four, five and six are encircled by separate endless conveyor belts 36. A seventh pair of pulleys 37 is located behind the fifth pair of pulleys and serve to guide the upper surface of conveyor belt 36 in the manner illustrated in FIGURE 1. The upper surface of each conveyor belt 27 is in intimate contact with the corresponding lower surface of conveyor belts 36.

The fourth pair of pulleys 28 is revolvable on short shafts 29 which extend from and are attached to the lower end of the lever arms 31. A pivot pin 38, extending from each of the frame side walls, engages the lever arm a short distance above the pulley and permits the lever arm to be pivoted in a plane parallel to that of the frame side walls. The upper extremity of the lever arm terminates in a small wheel 39, rotatable on an axis perpendicular to the frame side walls. Open helical tension springs 41 are attached at one end thereof to a point on each lever arm above the pivot pin, and the opposite ends of the spring are attached to lugs 42 extending from each of the frame side walls. The coil spring, by draw-

ing the upper part of the lever arm toward the lug, forces pulleys 28 against pulleys 22.

As seen in FIGURE 2, a pair of metal bars 43 and 44 spans the distance between the frame side walls and are positioned between pulleys 22 and pulleys 24. The distance between the upper bar 44 and the lower bar 43 is large enough for a knife blade to pass therebetween. A third bar 45 is located a distance above the bar 44 and below the second idler roll 17 and also spans the space between the frame side walls.

The cutting mechanism is mounted on a cross beam 46 which extends between and is firmly attached to the frame side walls. A pair of horizontal, cylindrical, guide rods 47 extend forwardly of said cross beam. Support plate 48 having two circular openings large enough to accommodate the guide rods is movable along said guide rods. A double acting air cylinder 49 is shown mounted behind the cross beam. Extending from the air cylinder is a piston rod 51 which passes through an opening in the cross beam and is attached to the center of the support plate 48 between the guide rods. The air cylinder, acting through the piston rod, pushes the support plate in a forward direction to a position shown in FIGURE 4 and then returns the support plate to its original position shown in FIGURE 1.

A horizontal cutting blade 52 extends forwardly of the support plate. As seen in FIGURE 3, the cutting edge of the blade tapers back from the mid-point to either end giving the blade, when viewed from below, a somewhat triangular outline. This particular shape is preferred when cutting certain limp films, e.g., polyethylene films. The cutting blade is attached to the support plate and extends horizontally forward of the support plate in such a plane that the blade, when driven forward, will pass through the narrow gap existing between bar 43 and bar 44.

Braking means designated generally as 63 and 64 function to hold the film web while the cutting blade slices the web. Each braking means consists of two short rods 53 which are attached at one end to the support plate and extend forwardly in a horizontal plane. A sleeve 54 fits over the forward end of the rods. An open helical compression spring 55 surrounds the rod from the support plate to the end of the sleeve. Clamps 56 mounted on the forward end of the sleeve grip a shaft 69 which carries a cylindrical rubber tube 57 which lies in a horizontal plane perpendicular to the plane of the frame side walls. Braking means 63 is positioned just above the cutting blade and opposite bar 44. The other braking means 64 is located opposite bar 45. As can be seen in FIGURE 1, the two braking means and the cutting blade extend the same distance forward of the support plate. A cross bar 58 mounted on the support plate rests against wheels 39 at the top of the lever arms 31.

Shaft 35, carrying pulleys 34, has geared wheels 59 mounted externally of and adjacent to each pulley. Geared wheels 61 are located on each of the rods 25 adjacent to each of the pulleys 26 between the pulley and the frame side wall. Wheel 61 meshes with wheel 59 on both sides of the apparatus.

Power to move the conveyor belts is transmitted to the shaft 35 from a variable speed electric motor 62 via a belt drive 63 which rotates the shaft. As shaft 35 and pulleys 34 are turned, gears 59 meshing with gear 61 drive rods 25 and pulley 26. Pulleys 34 and 26, which are drive pulleys, drive conveyor belts 36 and 27, respectively, about the other freely rotatable pulleys.

Operation

The electric motor 62 drives the conveyor belts in the direction shown by the arrows in FIGURE 1. The upper surfaces of belts 27 and the lower surfaces of belts 36 are in contact from meeting points of pulleys 22 and 28 to the points of contact of pulleys 34 and 26.

The web is unwound from the supply roll and fed over idler roll 16, under tension roll 18, over idler roll 17, and then down into the conveyor belt assembly. The conveyor belts are spaced so that they will grip or contact the side edges of the web. The web is fed between the conveyor belts 36 and 27, each pair of which grips opposite side edges of the web and carries the web along through the mechanism. The belts are made of rubber and have finely ridged surfaces that grip the film edges tightly.

When the desired length of film has been fed along the conveyor belts, the air cylinder, in response to a signal, drives the support plate 48 forward. Braking means 63 and 64 mounted on said support plate are pushed against bars 44 and 45, respectively. The film web is held tightly between the rubber tubes 57 and bars 44 and 45. At the same instant that the braking means restrains the web, the knife blade contacts the center of the web between the conveyor belts. As the knife slices through the web and passes through the gap between bars 43 and 44, each sleeve 54 of the braking means is pushed against springs 55 surrounding rods 53, thereby shortening the length of the braking means to permit the knife to pass through the gap and slice the film. It is to be noted that the resulting transverse slice only partially severs the web. That portion of the web adjacent to and between the conveyor belts is left intact. Simultaneously with the movement forward of the support plate, the cross bar 58 is moved against the uppermost portion of the lever arms 31 pushing them forward. This movement of the lever arms pivots pulleys 28 away from pulleys 22, thereby separating the heretofore contacting upper surfaces of belts 27 and lower surfaces of belts 36 at least to the point where these two surfaces are brought around pulleys 32.

The web is held tightly under tension as the knife slices through the film. The braking means hold the film tightly above the knife while the continuously moving conveyor belts still gripping the web below pulleys 32 maintain a steady downward pull on the film.

As the knife blade initiates a cut in the web, the conveyor belts, still gripping the lower portion of the web, continue to urge the web along through the conveyor assembly while that portion of the web above the knife slice is firmly held by the braking means. This strain set up in the web causes this partial slice in the web to be quickly propagated to both side edges of the web. The severed length is then carried along by the conveyor belts to the delivery end of the mechanism.

After the film has been severed, the air cylinder returns the support plate, knife and brake means to their original positions. As the cross bar 58 returns to its starting position, tension spring 41 urges the upper portion of lever arms 31 backwards, pushing pulleys 28 against pulleys 22 and causing the surfaces of the conveyor belts to again come into contact. As the conveyor surfaces come together, they again grip the side edges of the web and advance the film web until the air cylinder again drives the support plate and knife blade forward.

The air cylinder may be actuated by any suitable signal, for example, a photocell could actuate the cylinder by reading a signal placed on the web at suitable spaced intervals. Other signal means could be hand operated switches, timed switching devices, and devices triggered by any suitable measuring device.

The invention described in detail in the foregoing specification is subject to changes and modifications without departing from the principle and spirit thereof. The terminology used is for purposes of description and not of limitation, the scope of the invention being defined in the claims.

We claim:

1. In a web feed and severing machine, the combination of a conveying means gripping the side edges of a web and feeding said web along a predetermined path, means to drive said conveying means, a web cutter reciprocal across the path of the fed web between the side

edges of said web, braking means located upstream from said web cutter reciprocal against said web, releasing means that function to disengage said conveying means along the path upstream from said web cutter, means for driving said web cutter, said braking means and said releasing means, said braking means and said releasing means cooperating with said web cutter whereby as said web cutter advances against said web said releasing means disengages said conveying means and said braking means engages said web.

2. The machine described in claim 1 wherein the conveying means comprise two pairs of endless conveyor belts, a surface of a member of each pair of conveyor belts in contact with a surface of the other member of each pair, each pair of conveyor belts spaced apart so as to grip the side edges of the web between the contacting surfaces of the belts and to advance the web along with the moving belts.

3. A machine according to claim 2 wherein said releasing means separates the contacting surfaces of each pair of conveyor belts upstream from said web cutter.

4. In a web feed and severing machine, the combination of a frame, two pairs of endless conveyor belts mounted on said frame, a member of each pair of conveyor belts having a surface held in close contact with a surface of the other member of each pair, each pair of conveyor belts spaced apart so as to grip the side edges of a web which web is held tightly between the contacting surfaces of the belts, means to drive said pairs of endless conveyor belts, a web cutter reciprocal across the path of the web and positioned so as to partially slice the web transversely between the conveyor belts, braking means located upstream from said web cutter, releasing means functioning to separate the contacting surfaces of each pair of conveyor belts upstream from said web cutter, means driving said web cutter, said braking means and said releasing means, said braking means and said releasing means cooperating with said web cutter whereby as said web cutter is driven against said web said braking means engages the web and said releasing means separates the contacting surfaces of each pair of conveyor belts upstream from said web cutter, and as said web cutter is drawn away from said web, said braking means and said releasing means cease to exert their effect and permit the surfaces of the conveyor belts to again come in contact thereby gripping the web and advancing the web.

5. In a web feed and severing machine, the combination of a conveying means that functions to grip both sides of a web and continuously feed said web along a predetermined path, means to drive said conveying means, a web cutter reciprocal across the path of the fed web between the conveying means, braking means located upstream from said web cutter and adapted to stop the movement of the web, means for driving said web cutter and said braking means, said braking means cooperating with said web cutter whereby as said web cutter is driven against said web said braking means stops the movement of the web upstream from said web cutter.

6. In a continuous web feeding and severing machine the combination of a frame, two pairs of continuously running conveyor belts mounted on said frame, the surfaces of the belts in each pair being normally held in close contact with each other, said belt pairs being spaced apart so as to grip only the respective side edges of the web to be severed, which web is normally held tightly between the endless conveyor belts, means to drive said belt pairs, a web cutter reciprocal across the path of the web and operative to only partially slice the web transversely of that portion of the web lying between the conveyor belts, braking means located upstream from said web cutter, means upstream of said web cutter to release the web gripping contact of each of the belt pairs to a point downstream of said web cutter, means driving said web cutter, said braking means and said release means, said braking means and said release means cooperating with said web cutter whereby as said web cutter is driven against said web said braking means engages the web and said releasing means separates the contacting surfaces of each pair of conveyor belts upstream from said web cutter, and as said web cutter is drawn away from said web, said braking means and said releasing means cease to exert their effect and permit the surfaces of the conveyor belts to again come in contact thereby gripping the web and advancing the web.

7. Method of feeding and severing a web which comprises feeding the web between contacting surfaces of two spaced pairs of endless moving conveyor belts which grip the respective side edges of said web and carry the web along the path of the belt pairs, separating each of the belt pairs over a portion of their length, braking the web upstream of said separated portions, producing a partial slice in the web downstream from the braked portion with a knife that passes through the web between the pairs of conveyor belts, pulling the web downstream of the partial slice with the unseparated length of the belt pairs so as to cause the partial slice to be propagated to the side edges of the web, withdrawing the knife from cutting position and at the same time releasing the brake and recontacting the separated portions of the conveyor belt pairs so that they again grip and advance the web.

8. Method of feeding and severing a web which comprises feeding the web between contacting surfaces of two pairs of spaced apart endless moving conveyor belts which grip the web and carry the web along the path of the contacting belt pairs, braking the web to hold it at a point upstream of the web cutting knife, producing a partial transverse slice upstream of the knife and in that portion of the web between the spaced belt pairs, continuing to pull the web downstream of the partial slice against the resistance of the web braking means thereby causing the partial slice to be propagated to the side edges of the web and then the resulting severed web portion to be carried away downstream of the knife, essentially simultaneously withdrawing the knife from cutting position, releasing the film brake and again advancing the web along the path of the moving belt pairs.

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