

July 13, 1948.

B. A. HANNEWALD ET AL

2,445,174

WEB CUTTER

Filed May 8, 1946

3 Sheets-Sheet 1

FIG. 1.

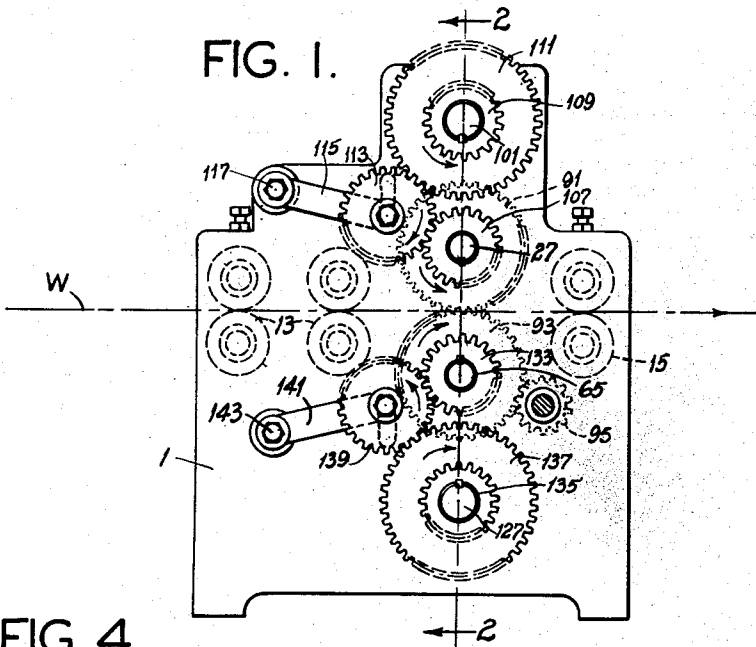


FIG. 4.

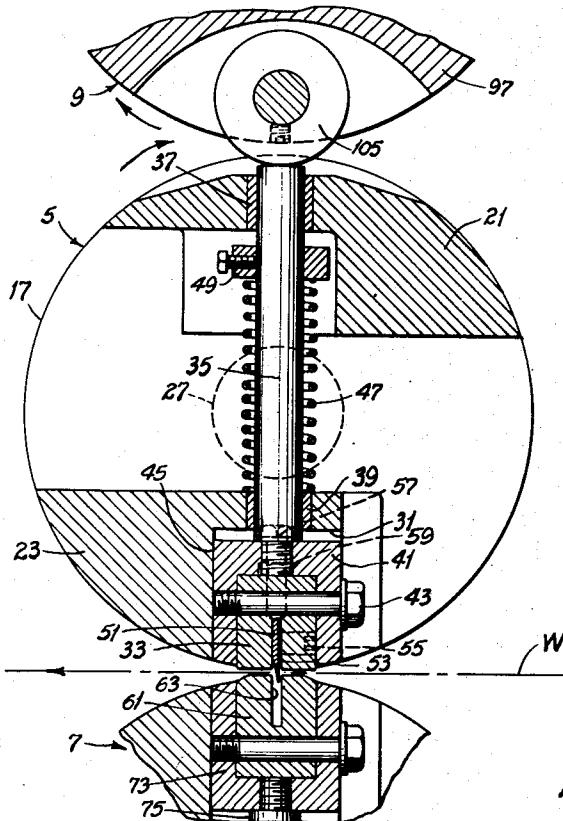
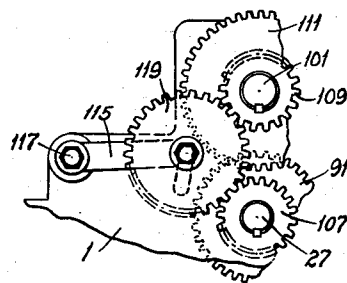


FIG. 5.



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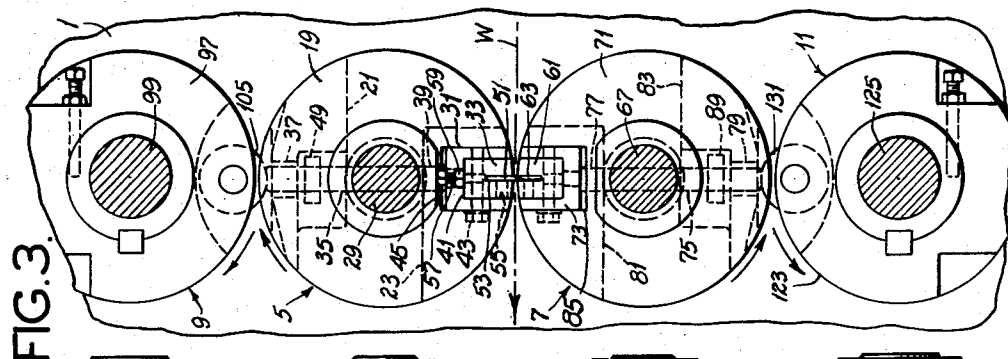
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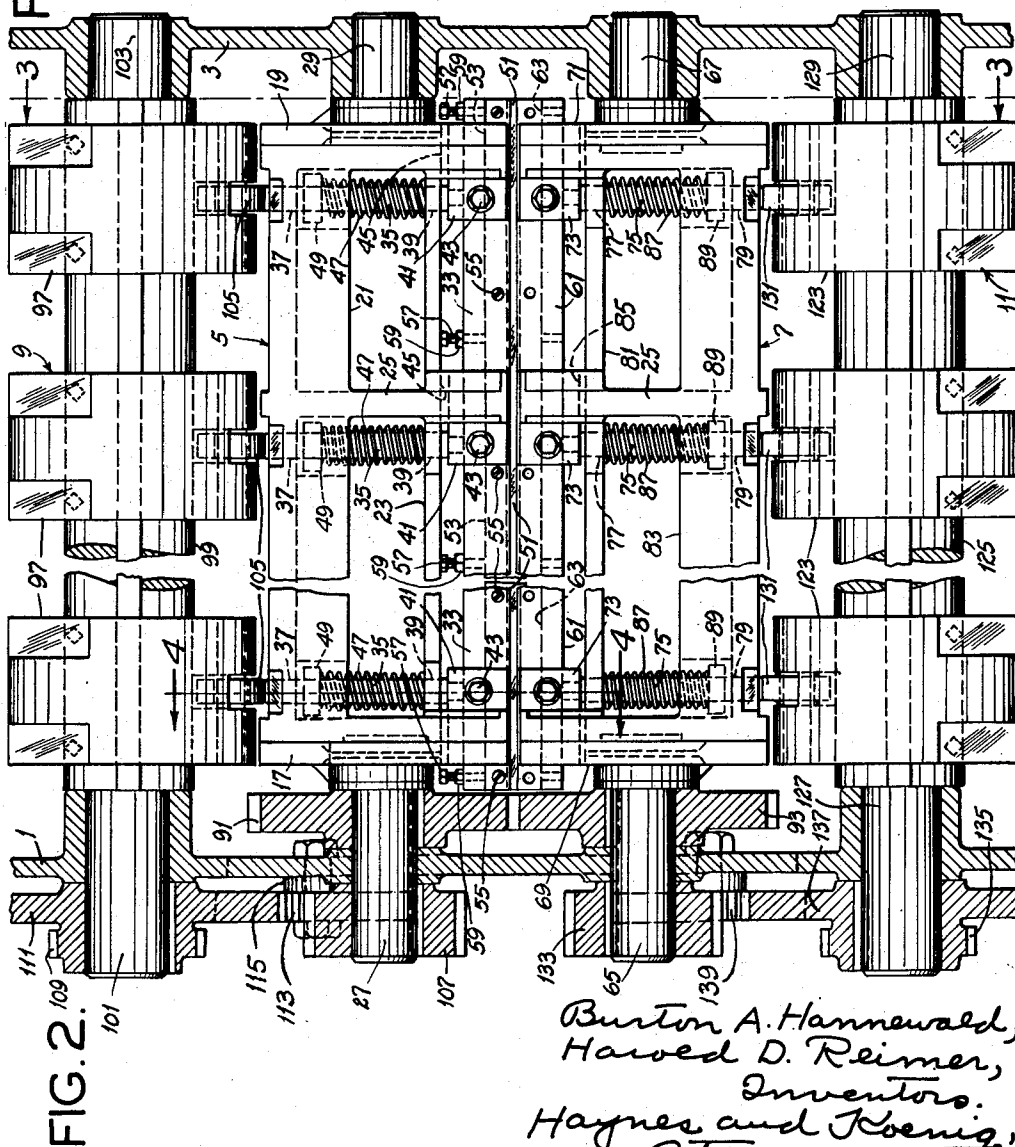


FIG. 2.

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WEB CUTTER

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3 Sheets-Sheet 3

FIG. 8.

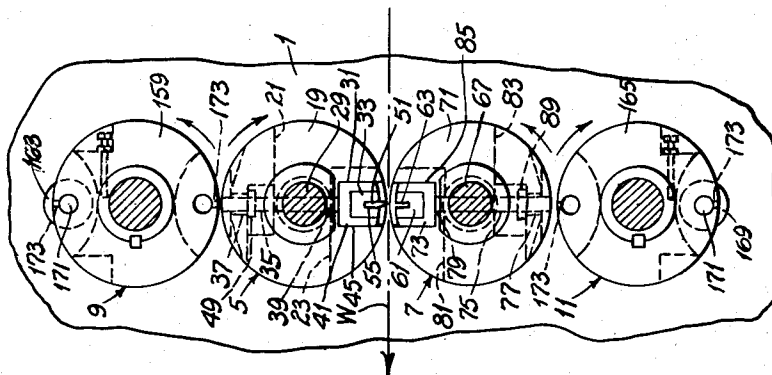


FIG. 7.

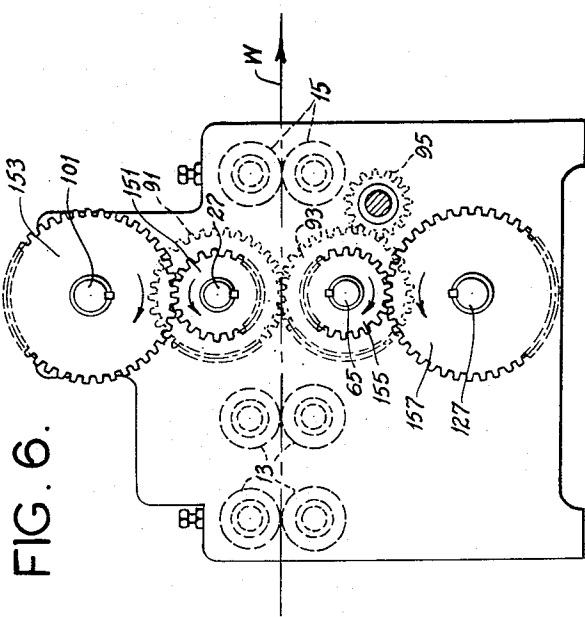
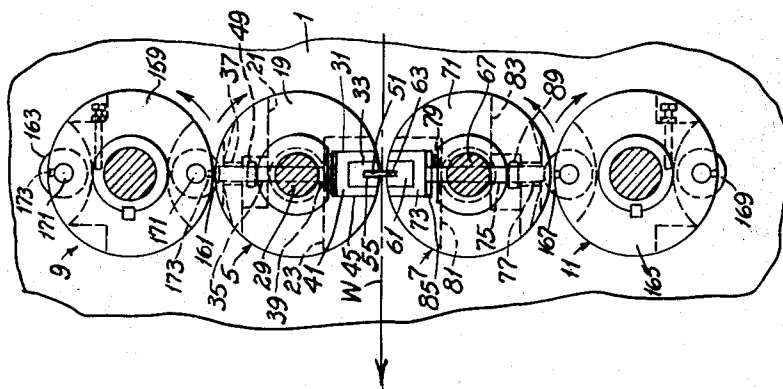


FIG. 6.

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UNITED STATES PATENT OFFICE

2,445,174

WEB CUTTER

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Application May 8, 1946, Serial No. 668,230

21 Claims. (Cl. 164—66)

1

This invention relates to web cutters, and, more particularly, to rotary web cutters adapted to sever into equal lengths a continuously traveling web.

Among the several objects of the invention may be noted the provision of a rotary web cutter for severing into equal lengths a continuous traveling web; the provision of a cutter of the class described for efficiently cutting any one of a wide range of different predeterminable lengths; the provision of a rotary cutter of the class described wherein the cutter is readily selectively operable either upon each revolution thereof or upon a plurality of revolutions thereof; and the provision of such a cutter which is adapted to be constructed to sever a web of substantial width without undue blade deflection. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

Fig. 1 is a side elevation of the web cutter of this invention particularly illustrating gearing associated therewith;

Fig. 2 is an enlarged longitudinal section taken on line 2—2 of Fig. 1;

Fig. 3 is vertical section taken on line 3—3 of Fig. 2;

Fig. 4 is an enlarged vertical section taken on line 4—4 of Fig. 2;

Fig. 5 is a partial side elevation similar to Fig. 1 but showing a different arrangement of gearing;

Fig. 6 is a side elevation of a modification of the web cutter of Figs. 1—5, particularly illustrating gearing associated therewith;

Fig. 7 is an enlarged vertical section through the cutter of Fig. 6, similar to Fig. 3, and illustrating an arrangement wherein the web is severed upon each revolution of the cutter; and,

Fig. 8 is a section similar to Fig. 7 but showing an arrangement wherein the web is severed upon every other revolution of the cutter.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now to Figs. 1—5, numerals 1 and 3 designate spaced frame plates wherein are journaled a rotary knife carrier 5, a rotary abutment carrier 7, and upper and lower rotary cam elements 9 and 11, respectively. Also journaled in the frame plates are feed rolls 13 for feeding a web W to the cutter and draw rolls 15 for feeding

2

cut lengths from the cutter. The rolls are adapted to be driven at suitable speeds by any suitable drive mechanism (not shown).

The rotary knife carrier comprises a generally cylindrical cage-like structure including a pair of end discs 17 and 19 joined by radially offset longitudinal bars 21 and 23 and a plurality of reinforcing discs 25 spaced intermediate the end discs. Trunnions 27 and 29 on end discs 17 and 19, respectively, are journaled in suitable bearings in the frame plates. Each of the end and reinforcing discs is notched, as indicated at 31, to provide guides for a radially reciprocating knife holder 33.

A plurality of cam follower rods 35 are journaled for reciprocation in transverse bearings 37 and 39 provided in bars 21 and 23, respectively. A fork 41 is secured to the end of each rod beyond where the rod extends through a bearing 39. The other end of each rod extends through a bearing 37. This other end is actuated by the cam element 9 in a manner to be hereinafter described. The knife holder 33 is secured in the forks 41 at intervals by bolts 43. Grooves 45 are provided in bar 23 to accommodate the forks. The rods 35 are normally biased to retract the knife holder to the inner ends of notches 31. This is accomplished by compression springs 47 reacting between bar 23 and collars 49 secured on the rods. The forks 41 are slidably guided in notches 31.

The knife holder 33 carries a knife blade 51 extending the full length thereof and secured in a groove 53 by set screws 55. The blade projects outward from the holder a distance determined by positioning screws 57, the latter being threaded through the back of the knife holder into the groove and retained in adjusted position by lock nuts 59. This distance is such that when the knife holder is retracted to its innermost limit the projecting blade is wholly within the periphery of the cage-like rotary knife carrier 5.

The rotary abutment carrier 7 is of the same construction as the rotary knife carrier with the exception that it includes an abutment bar 61 having a longitudinal groove 63 therein instead of a knife holder. Trunnions 65 and 67 on end heads 69 and 71, respectively, of the rotary abutment carrier are journaled in suitable bearings in the frame plates 1 and 3. They are on an axis spaced from the axis of the rotary knife carrier a distance somewhat greater than the diameter of the carriers so as to provide a space for passage of the web to be cut.

The abutment bar 61 is mounted for radial reciprocation in the rotary abutment carrier in the same manner as the knife holder is mounted in the knife carrier. It is secured in forks 73 on the ends of reciprocating cam follower rods 75 journaled in bearings 77 and 79 in longi-

3

tudinal bars 81 and 82. Rods 75 are biased to retract the abutment bar to an innermost limit determined by the inner ends of guide notches 85. This is accomplished by compression springs 87 reacting between bar 81 and collars 89 secured on the rods. The rods 75 extend through the bearings 79 so as to be actuated by cam element 11 in a manner to be hereinafter described.

The rotary knife carrier 5 and the rotary abutment carrier 7 are geared to rotate in unison by gears 91 and 93 keyed on trunnions 27 and 85 respectively. These gears have the same pitch diameters and are so phased that the knife blade 51 engages in the groove 63 when the knife holder 33 and the abutment bar are moved radially outward to the Fig. 4 position. A gear 95, driven by the cutter drive motor (not shown) meshes with gear 93 to drive the carriers 5 and 7 (see Fig. 1).

The upper cam element 9 comprises a plurality of collars 97 fixed in spaced relation on a cam shaft 99 having end trunnions 101 and 103 journaled in the frame plates 1 and 3. Each collar includes a cam roller 105 projecting beyond the periphery thereof. The collars are so spaced that the rollers 105 engage the ends of rods 35 upon each revolution of shaft 99 and move the rods radially to move the knife holder 33 to the position wherein blade 51 projects beyond the periphery of rotary knife carrier 5 (Fig. 4) and into the bar 61. When rollers 105 ride off the ends of rods 35, the springs 47 bias the rods and knife holder to retracted positions.

Trunnions 27 and 101 project beyond the frame plate 1. A spur gear 107 is keyed upon the projecting end of trunnion 27. A gear cluster comprising a small spur gear 109 having the same number of teeth as gear 107 and a large spur gear 111 having twice as many teeth as gear 107 is keyed on the projecting end of trunnion 101. As illustrated in Fig. 1, an idler change gear 113 is in mesh with gears 107 and 111 so that cam shaft 99 and cam rollers 105 are driven at half the speed of the rotary knife carrier 5. The idler gear is rotary on the end of an arm 115 pivoted at 117 on frame plate 1 and may be removed and replaced by an idler gear 119 meshing with gears 107 and 109 so as to provide a 1:1 drive ratio between the rotary knife carrier 5 and the rotary cam element 9 (Fig. 5).

The lower cam element 11 is identical with the upper cam element and comprises collars 123 on cam shaft 125 having end trunnions 127 and 129. Each collar includes a cam roller 131 which engages a rod 75 upon each revolution of shaft 125 to move the abutment bar 61 to the position wherein it projects beyond the periphery of the rotary abutment carrier 7 (Fig. 4). When cam rollers 131 ride off the ends of rods 75, the springs 87 bias the rods and abutment bar to retracted position.

Trunnions 65 and 127 project beyond the frame plate 1. A wide spur gear 133 identical with gear 107 is keyed upon the projecting end of trunnion 65. A gear cluster comprising a small spur gear 135 and a large spur gear 137 identical with gears 109 and 111, respectively, is keyed on the projecting end of trunnion 127. As illustrated in Fig. 1, an idler change gear 139 is in mesh with gears 133 and 137 to drive the cam shaft 125 and cam rollers 131 at half the speed of the rotary abutment carrier 7. The idler gear is rotatable on the end of an arm 141 pivoted at 143 on frame plate 1 and may

4

be removed and replaced by an idler gear (not shown), corresponding to idler gear 119, meshing with gears 133 and 135 to provide a 1:1 drive ratio between the rotary abutment carrier 7 and the rotary cam element 11.

The cam rollers 105 and 131 are phased to engage rods 35 and 75, respectively, to move the rods toward each other when the knife holder 33 and the abutment bar 61 reach the mating position shown in Fig. 4. Such engagement occurs upon each revolution of the rotary knife and abutment carriers when a 1:1 drive ratio is established between these carriers and the cam shafts (Fig. 5) or upon two revolutions of the carriers when a 2:1 drive ratio is established (Fig. 1).

Operation is as follows:

Assume that it is desired to cut lengths of web approximately equal to the circumference of the rotary knife and abutment carriers 5 and 7. Idler gear 119 will be in mesh with gears 107 and 109 and a similar idler gear will be in mesh with gears 133 and 135 to establish a 1:1 drive ratio between the carriers 5 and 7 and the cam shafts 99 and 125 (Fig. 5). The speed of feed rolls 13 and 15 will be made such as to feed the web between the carriers 5 and 7 at a linear velocity equal to the tangential velocity of the periphery of the carriers.

Assuming that the web has just been severed, the parts will be in the position shown in Fig. 4, wherein the knife blade 51 has been advanced by cam rollers 105 into the groove 63 in abutment bar 61, and the abutment bar has been advanced by cam rollers 131 into position to cooperate with the blade. The rotary knife carrier 5 rotates clockwise, the rotary abutment carrier 7 rotates counterclockwise, and the web travels to the left as viewed in Fig. 4. As the carriers continue to rotate, the cam rollers 105 and 131 rotate in unison therewith and ride off the ends of rods 35 and 75, respectively. The springs 47 and 87 retract the knife holder 33 and abutment bar 61 to their innermost limits. When the carriers 5 and 7 have completed one revolution, the cam rollers 105 and 131 have also completed one revolution and again engage rods 35 and 75 to move the knife holder 33 and the abutment bar 61 to the Fig. 4 position. In this position blade 51 projects into groove 63 to sever the web. Draw rolls 15 thereupon draw the cut length away from the cutter. Feed rolls 13 feed more web between the carriers 5 and 7. Thus the web is severed into equal lengths in a continuous operation.

If it is desired to cut lengths less than the periphery of the carriers 5 and 7, the speed of feed rolls 13 and 15 is reduced to feed the web through the cutter more slowly while maintaining the same speed of carriers 5 and 7. While the web will be severed upon each revolution of the carriers, the length of web fed therebetween during the interval between severing operations will be reduced, so that any desired length shorter than the periphery of the carriers may be cut off.

If it is desired to cut lengths longer than the periphery of the carriers 5 and 7, the idler gears above described are removed and replaced by idler gear 113 meshing with gears 107 and 111 and idler gear 139 meshing with gears 133 and 137 (Fig. 1). This establishes the 2:1 drive ratio between the carriers 5 and 7 and the cam shafts. The latter rotate at half the speed of the carriers. Assuming that the web has just been severed, and the

5

parts are in the Fig. 4 position, the rotary knife carrier 5 and the rotary abutment carrier 7 continue rotation clockwise and counterclockwise, respectively, from that position through two revolutions before the cam rollers 105 and 131 complete one revolution and return to the position wherein they engage rods 35 and 75 to actuate the knife blade and abutment bar. Thus the interval between severing operations is twice that in the case of the 1:1 drive ratio, and, for a given web speed, lengths of web twice as long as in the first case are cut. It will be apparent that with the 2:1 drive ratio, different predetermined lengths may be cut by adjusting the speed of feed rolls 13 and 15.

The rotary web cutter is particularly useful to cut bag tubing into bag lengths. The web in such a case comprises a continuous paper tube. In practice, the cutter is designed to cut off bag lengths from approximately ten inches to forty-two inches long. For lengths from ten inches to twenty-five inches, the 1:1 drive ratio between the carriers 5 and 7 and the cam shafts 99 and 125 is established. For lengths over twenty-five inches, the 2:1 drive ratio between the carriers and the cam shafts is established. The carriers have a periphery of approximately twenty-five inches.

Thus, the rotary web cutter is adapted to cut a wide range of lengths simply by changing the drive ratio between the rotary knife and abutment carriers 5 and 7 and the cam elements 9 and 11 and, if necessary, the speed of travel of the web. It will be apparent that other drive ratios such as 3:1 or 4:1 may be established by providing additional spur gears on trunnions 101 and 107, or by other suitable geared connections.

The rotary web cutter of Figs. 1-5 is entirely satisfactory if high speed operation of the rotary knife and abutment carriers is not essential. The rotary knife carrier 5 and the cam element 9 rotate in the same direction (clockwise as viewed in Fig. 3). Similarly, the rotary abutment carrier 7 and the cam element 11 rotate in the same direction (counterclockwise as viewed in Fig. 3). Consequently, when cam rollers 105 strike the ends of the follower rods 35 these elements are travelling in opposite tangential directions. Similarly, when cam rollers 131 strike the ends of the follower rods 75 these elements are travelling in opposite tangential directions. For example, rollers 105 are travelling to the left and the ends of rods 35 are travelling to the right, as viewed in Fig. 3. The cam rollers therefore rapidly engage and disengage the follower rods and cause a rapid reciprocation of the knife and abutment bar. At high angular velocities of the rotary knife and abutment carriers and cam elements, such action may be less desirable because of increased wear of the parts.

Figs. 6-8 illustrate a modification adapted for high speed operation wherein the cam rollers strike the follower rods while travelling in the same tangential direction. This modification corresponds to that shown in Figs. 1-5 except for modifications in the gearing connections between the rotary knife and abutment carriers and cam elements, and in the arrangement of the cam rollers upon the cam elements. It includes rotary knife and abutment carriers 5 and 7 and cam elements 9 and 11 as in Figs. 1-5, the carriers 5 and 7 being geared to rotate in unison by gears 91 and 93 and driven by gear 95. Cam element 9, however, is geared directly to the rotary knife carrier 5 to rotate at half the speed

6

of carrier 5. This is accomplished by providing a spur gear 151 on trunnion 27 meshing with gear 153 on trunnion 101. Gear 153 has twice the pitch diameter and twice the number of teeth of gear 151. Similarly, cam element 11 is geared directly to the rotary abutment carrier 11 to rotate at half the speed of carrier 11. This is accomplished by providing a spur gear 155 on trunnion 85 meshing with gear 157 on trunnion 127. Gear 157 has twice the pitch diameter and twice the number of teeth of gear 155.

The upper cam element 9 is in all respects like that of Figs. 1-5, except that the collars 97 are replaced by collars 159 each of which has two diametrically opposed cam rollers 161 and 163 thereon. Each of rollers 161 and 163 is detachably journaled in the collar so that one or the other of these rollers may be removed. The lower cam element 11 is in all respects like that of Figs. 1-5, except that the collars 123 are replaced by collars 165 each of which has two diametrically opposed cam rollers 167 and 169 thereon. Each of rollers 167 and 169 is detachably journaled in the collar so that one or the other of these rollers may be removed. The cam rollers may be detachably journaled in the collars as, for example, by having the rollers rotatably mounted on shafts 171 which are detachably secured in the collars by set screws 173.

In the Figs. 6-8 modification, the rotary knife carrier 5 and the cam element 9 rotate in opposite directions because they are directly geared by gears 151 and 153. Similarly, the rotary abutment carrier 7 and the cam element 11 rotate in opposite directions because they are directly geared by gears 155 and 157. Consequently, when cam rollers 161 or 163 strike the ends of the follower rods 35 these elements are travelling in the same tangential direction. Similarly, when cam rollers 167 or 169 strike the ends of follower rods 75 these elements are travelling in the same tangential direction. The cam rollers therefore engage and disengage the follower rods with less relative velocity and cause a gradual reciprocation of the knife and abutment bar. This permits operation of the rotary knife and abutment carriers 5 and 7 and the cam elements 9 and 11 at high angular velocities, without unduly fast cam operation and hence with reduced wear.

Operation of the Figs. 6-8 modification is as follows:

Assume that it is desired to cut bag lengths twenty-five inches long. Both sets of cam rollers 161 and 163 are connected in the collars 159 (Fig. 7). Similarly, both sets of rollers 167 and 169 are connected in the collars 165. The speed of the feed rolls 13 and 15 is made such as to feed the web between the carriers 5 and 7 at a linear velocity equal to the tangential velocity of the periphery of the carriers. Cam elements 9 and 11 rotate at half the speed of the carriers 5 and 7, but since there are two diametrically opposed sets of cam rollers in each cam element the knife 51 and abutment bar 61 are actuated upon each revolution of the carriers to sever the web into lengths equal to the periphery of the carriers. Cam rollers 161 and 163 engage follower rods 35 upon each half-revolution of cam element 9 and cam rollers 167 and 169 engage follower rods 75 upon each half-revolution of cam element 11. The operation is analogous to the operation of the Fig. 3 cutter with a 1:1 drive ratio. If it is desired to cut lengths less than twenty-five inches, the speed of feed rolls 13 and 15 is correspondingly reduced.

7

If it is desired to cut lengths longer than twenty-five inches, the set of cam rollers 161 and the set of cam rollers 167 are removed (Fig. 8). As before, cam elements 9 and 11 rotate at half the speed of the carriers 5 and 7, and since there is only one set of rollers on each cam element the knife and abutment bar are actuated upon every other revolution of the carriers rather than upon each revolution. This operation is analogous to the operation of the Fig. 3 cutter with a 2:1 drive ratio. Different predetermined lengths longer than twenty-five inches may be cut by adjusting the speed of feed rolls 13 and 15.

A particular advantage of the construction of both forms of web cutter is that forces are applied to the knife to drive it through the web at relatively closely spaced points along its entire length. The rods 35 are secured to the knife holder 33 at relatively closely spaced intervals and support the holder at such intervals throughout its length. As distinguished from constructions wherein the knife is supported and operated only at its ends, this invention provides a rigid, steady cutter which may be of substantial width to sever relatively wide webs. This is because it permits the use of a long knife. Where, as heretofore, the knife is supported and actuated only at its ends, the length of a sufficiently rigid knife is limited, due to the absence of intermediate supports and operating means. The full width of the cutter of this invention is not illustrated in Fig. 2, the view being broken for convenience in presentation in small space, but it will be understood that the cutter may be of such width that the carriers 5 and 7 include four or more of the rods 35 and 75.

It will be clear that the objects of the invention will be obtained by any multiplicity of cam follower means in the carriers having common attachments to a single knife and extending substantially along the entire length of the knife. Also, the group of cam rollers 105 are like a single cam extending throughout a substantial length for engaging all of the followers.

Although the knife blades and carriers as shown in the drawings are exactly axially located, that is, upon elements of imaginary cylinders, it will be understood that they may be formed helically, that is, along a helix on such a cylinder. The followers such as 35 would then be helically arranged, and the cam elements 105 helically phased. These would all be broadly equivalents.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A rotary cutter comprising a rotary elongate knife carrier, an elongate knife extending substantially axially in the carrier and mounted therein for radial movement, a plurality of followers attached to the knife and spaced throughout its length, a common rotary cam means for simultaneously operating all of said followers, and a change gear connection between the rotary carrier and the rotary cam means.

2. A cutter comprising a rotary knife carrier, an elongate guide in the carrier, an elongate knife in the guide which is movable substantially radially at one peripheral portion of the carrier, a plurality of followers attached to the knife,

8

guides in the carrier for said followers, the followers having operating extensions from an opposite peripheral portion of the carrier, means biasing the followers to draw the knife into the carrier and to expose said extensions for operation, common rotary cam means adjacent to the carrier and engageable simultaneously with all of said extensions, and driving means between the carrier and said common cam means.

3. A cutter comprising a knife carrier, rotary on one axis, an elongate guide in the carrier, an elongate knife in the guide which is movable substantially radially at one peripheral portion of the carrier, a plurality of followers attached to the knife, guides in the carrier for said followers, the followers having operating extensions from an opposite peripheral portion of the carrier, means biasing the followers to draw the knife into the carrier and to expose said extensions for operation, common cam means rotary on a parallel axis and adjacent to the carrier and engageable simultaneously with all of said extensions, and connecting driving means between the carrier and said common cam means adapted to phase their rotations so that the followers are engageable intermittently by the common cam means.

4. A cutter comprising a knife carrier rotary on one axis, an elongate guide in the carrier, an elongate knife in the guide which is movable substantially radially at one peripheral portion of the carrier, a plurality of followers attached to the knife, guides in the carrier for said followers, the followers having operating extensions from an opposite peripheral portion of the carrier, means biasing the followers to draw the knife into the carrier and to expose said extensions for operation, common rotary cam means rotary on a parallel axis and adjacent to the carrier and engageable simultaneously with all of said extensions, connecting driving means between the carrier and said common cam means, adapted to phase their rotations so that the followers are engaged intermittently by the common cam means, and means in said driving means for changing the phasing of the carrier and the cam means.

5. A cutter comprising a rotary knife support and a rotary cam support, a mechanism in the knife support biased to hold the knife in a retracted position with respect to its support and having a follower element located in a protruding position when the knife is retracted, a cam on the rotary cam support engageable with said follower element for said mechanism against its bias to protrude the knife, and a driving gear between the rotary knife support and the rotary cam support adapted to phase their rotations so that the cam and the protruding element cooperate cyclically.

6. A cutter comprising a rotary knife support and a rotary cam support, a mechanism in the knife support biased to hold the knife in a retracted position and having a follower element located in a protruding position when the knife is retracted, a cam on the rotary cam support engageable with said follower element for said mechanism against its bias to protrude the knife, and a changeable gear drive between the rotary knife support and the rotary cam support adapted selectively to phase their rotations so that the cam and the protruding element cooperate cyclically according to selectable timing.

7. A cutter comprising a rotary knife support and a rotary cam support, a sliding mechanism

in the knife support biased to hold the knife in a retracted position and having a follower element located in a radially opposite protruding position when the knife is retracted, a rotary cam on the rotary cam support engageable with said follower element for said mechanism against its bias to protrude the knife, and a driving gear between the rotary knife support and the rotary cam support adapted to phase their rotations so that the cam and the protruding element cooperate cyclically.

8. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife carrier, a knife mounted for movement in said carrier between a position wherein it is disposed within the periphery of said carrier and a position wherein it projects beyond the periphery, means for moving said knife comprising a plurality of cam followers secured thereto at spaced intervals along its length, common cam means for intermittently operating said followers, abutment means cooperable with said knife in its projected position for severing the web, said cam means comprising commonly rotary cams adapted to engage said followers upon revolution of said cam means, and means for driving said cams at one of a plurality of different drive ratios as related to said carrier.

9. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife carrier, a knife mounted for radial reciprocation in said carrier between a position wherein it is disposed within the periphery of the carrier and a position wherein it projects beyond the periphery, means for reciprocating said knife comprising a plurality of cam followers secured thereto at spaced intervals along its length, cam means for intermittently operating said followers, rotary abutment means cooperable with said knife in its projected position for severing the web, said cam means comprising rotary cams adapted to engage said followers upon revolution of said cams, and means for driving said cams at one of a plurality of different drive ratios as related to said carrier.

10. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife carrier having a plurality of axially spaced transverse bearings therein, a cam follower rod reciprocable in each bearing, one end of each rod being secured to a knife, said rods and knife being reciprocable between a first position wherein the knife is disposed within the periphery of the carrier and the other ends of said rods project substantially beyond said periphery and a second position wherein the knife projects beyond the periphery of the carrier, means for biasing said rods and knife to said first position, cam means adapted intermittently to engage said projecting ends of the rods to move said knife to said second position, and abutment means cooperable with said knife in said second position for severing the web.

11. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife carrier having a plurality of axially spaced transverse bearings therein, a cam follower rod reciprocable in each bearing, one end of each rod being secured to a knife, said rods and knife being reciprocable between a first position wherein the knife is disposed within the periphery of the carrier and the other ends of said rods project substantially beyond said periphery and a second position wherein the knife projects beyond the periphery of the carrier, means for biasing

said rods and knife to said first position, cam means adapted intermittently to engage said projecting ends of the rods to move said knife to said second position, abutment means cooperable with said knife in said second position for severing the web, said cam means comprising rotary cams adapted to engage said rods upon each revolution of the cams, and means for driving said cams at one of a plurality of different drive ratios as related to said carrier.

12. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife, a rotary abutment carrier, an abutment bar mounted for movement in said carrier between a position wherein it is substantially within the periphery of said carrier and a position wherein it projects beyond said periphery into cooperative relation with said knife to sever the web, means for moving said abutment bar comprising a plurality of cam followers secured thereto at spaced intervals along its length, rotary cam means for intermittently operating said followers, said cam means being adapted to engage said followers upon each revolution of said cams, and means for driving said cams at one of a plurality of different drive ratios as related to said carrier.

13. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife, a rotary abutment carrier, an abutment bar mounted for radial reciprocation in said carrier between a position wherein it is substantially within the periphery of said carrier and a position wherein it projects beyond said periphery into cooperative relation with said knife to sever the web, means for reciprocating said abutment bar comprising a plurality of cam followers secured thereto at spaced intervals along its length, cam means for intermittently operating said followers, said cam means comprising rotary cams adapted to engage said followers upon revolution of said cams, and means for driving said cams at one of a plurality of different drive ratios as related to said carrier.

14. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife, a rotary abutment carrier having a plurality of axially spaced transverse bearings therein, a cam follower rod reciprocable in each bearing, one end of each rod being secured to a grooved abutment bar, said rods and bar being reciprocable between a first position wherein the bar is substantially within the periphery of the rotary abutment carrier and the other ends of the rods project substantially beyond said periphery and a second position wherein the bar projects beyond said periphery and the knife may enter the groove in said bar to sever the web, means for biasing said bar to said first position, and cam means adapted intermittently to engage said projecting ends of the rods to move said bar to said second position.

15. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife, a rotary abutment carrier having a plurality of axially spaced transverse bearings therein, a cam follower rod reciprocable in each bearing, one end of each rod being secured to a grooved abutment bar, said rods and bar being reciprocable between a first position wherein the bar is substantially within the periphery of the rotary abutment carrier and the other ends of the rods project substantially beyond said periphery and a second position wherein the bar projects beyond said periphery and the knife may enter the groove in said bar to sever the web, means for biasing

said bar to said first position, cam means adapted intermittently to engage said projecting ends of the rods to move said bar to said second position, said cam means comprising rotary cams adapted to engage said rods upon each revolution of the cams, and means for driving said cams at one of a plurality of different drive ratios as related to said carrier.

16. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife carrier, a knife mounted for movement in said carrier between a position wherein it projects beyond the periphery of said carrier and a position wherein it is disposed within said periphery, a rotary abutment carrier, a grooved abutment bar mounted for movement in said abutment carrier between a projected position wherein its groove is adapted to receive the projected knife and a retracted position substantially within the periphery of said abutment carrier, means for moving said knife comprising a plurality of cam followers secured thereto at spaced intervals along its length, cam means for intermittently operating said followers, means for moving said abutment bar comprising a plurality of cam followers secured thereto at spaced intervals along its length, cam means for intermittently operating said last-named followers, each of said cam means comprising rotary cams adapted to engage the related followers upon each revolution of the cams, and means for driving said cams at one of a plurality of different drive ratios as related to said carriers.

17. A rotary web cutter adapted to sever a travelling web into lengths, comprising a rotary knife carrier, a knife mounted for radial reciprocation in said carrier between a position wherein it projects beyond the periphery of said carrier and a position wherein it is disposed within said periphery, a rotary abutment carrier, a grooved abutment bar mounted for radial reciprocation in said abutment carrier between a projected position wherein its groove is adapted to receive the projected knife and a retracted position substantially within the periphery of said abutment carrier, means for reciprocating said knife comprising a plurality of cam followers secured thereto at spaced intervals along its length, cam means for intermittently operating said followers, means for reciprocating said abutment bar comprising a plurality of cam followers secured thereto at spaced intervals along its length, cam means for intermittently operating said last-named followers, each of said cam means comprising rotary cams adapted to engage the related followers upon each revolution of the cams, and means for driving said cams at one of a plurality of different drive ratios as related to said carrier.

18. A rotary cutter comprising a rotary elongate knife carrier, an elongate knife extending substantially axially in the carrier and mounted therein for radial movement, a plurality of followers attached to the knife and spaced throughout its length, a common rotary cam means for simultaneously operating all of said followers, and a direct reduction gear connection between said carrier and the cam means whereby said cam means rotates in the direction opposite to that of the carrier and at half its speed, said cam means comprising a plurality of sets of cams phased to operate said follower upon each revolution of said carrier, at least one of said sets of cams being detachable.

lution of said carrier, at least one of said sets of cams being detachable.

19. A rotary cutter comprising a rotary elongate knife carrier, an elongate knife extending substantially axially in the carrier and mounted therein for radial movement, a plurality of followers attached to the knife and spaced throughout its length, a common rotary cam means for simultaneously operating all of said followers, and a direct 2:1 reduction gear connection between said carrier and cam means whereby said cam means rotates in the direction opposite to that of the carrier and at half its speed, said cam means comprising two diametrically opposed sets of cams for operating said followers upon each revolution of said carrier, at least one of said sets of cams being detachable.

20. A rotary cutter comprising a rotary knife, a rotary elongate abutment carrier, an elongate abutment bar extending substantially axially in said carrier and mounted therein for radial movement between a position wherein it is substantially within the periphery of said carrier and a position wherein it projects beyond said periphery into cooperable relation with said knife to sever the web, a plurality of followers attached to said bar and spaced throughout its length, a common rotary cam means for simultaneously operating all of said followers, and a direct reduction gear connection between said carrier and cam means whereby said cam means rotates in the direction opposite to that of the carrier and at reduced speed, said cam means comprising a plurality of sets of cams phased to operate said followers upon each revolution of said carrier, at least one of said sets of cams being detachable.

21. A rotary cutter comprising a rotary knife, a rotary elongate abutment carrier, an elongate abutment bar extending substantially axially in said carrier and mounted therein for radial movement between a position wherein it is substantially within the periphery of said carrier and a position wherein it projects beyond said periphery into cooperable relation with said knife to sever the web, a plurality of followers attached to said bar and spaced throughout its length, a common rotary cam means for simultaneously operating all of said followers, and a direct 2:1 reduction gear connection between said carrier and cam means whereby said cam means rotates in the direction opposite to that of the carrier and at half its speed, said cam means comprising two diametrically opposed sets of cams for operating said followers upon each revolution of said carrier, at least one of said sets of cams being detachable.

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