

Feb. 28, 1956

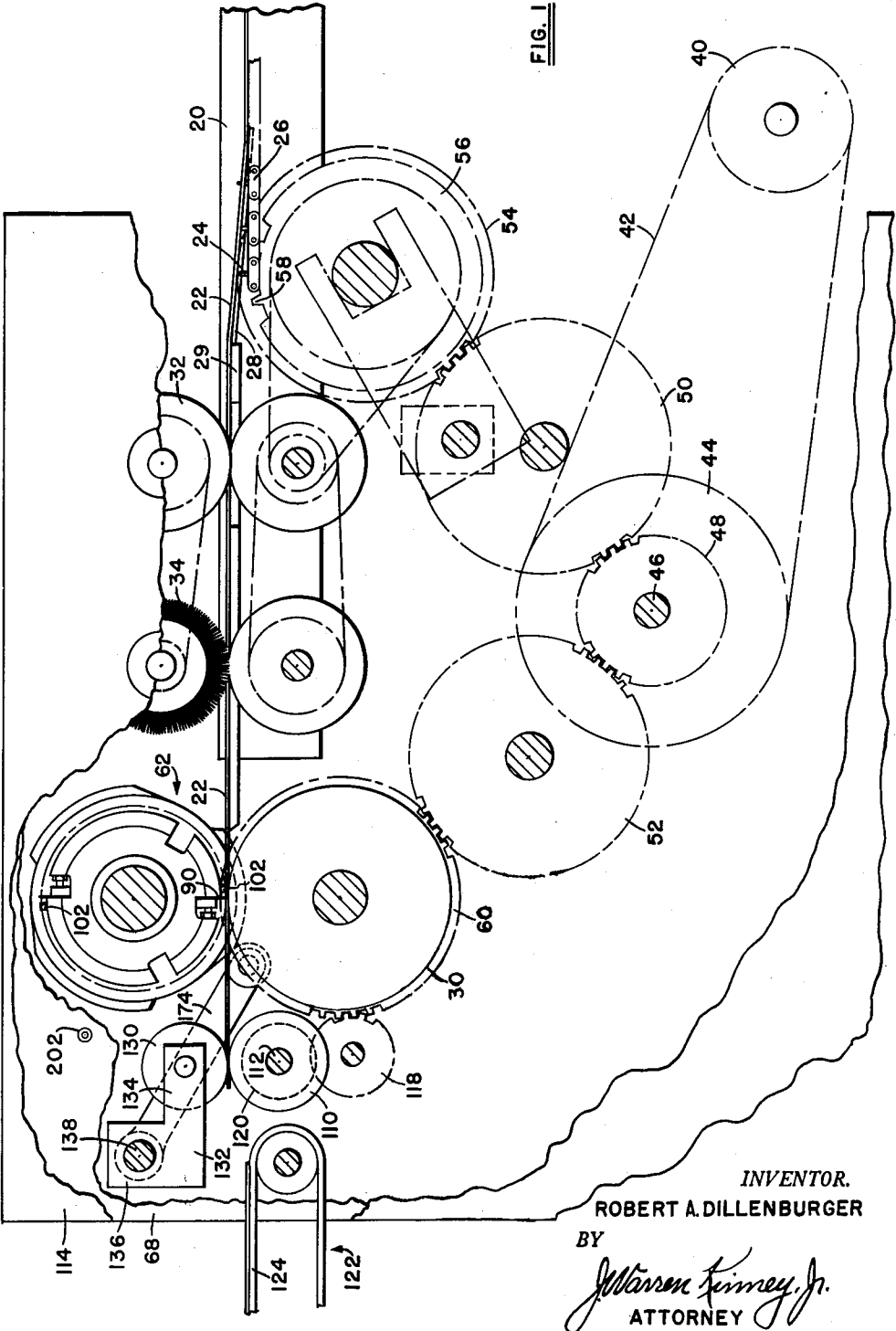
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2,736,380

ROTARY CUT-OFF ASSEMBLY WITH A PULL-OUT ROLL

Filed Feb. 26, 1951

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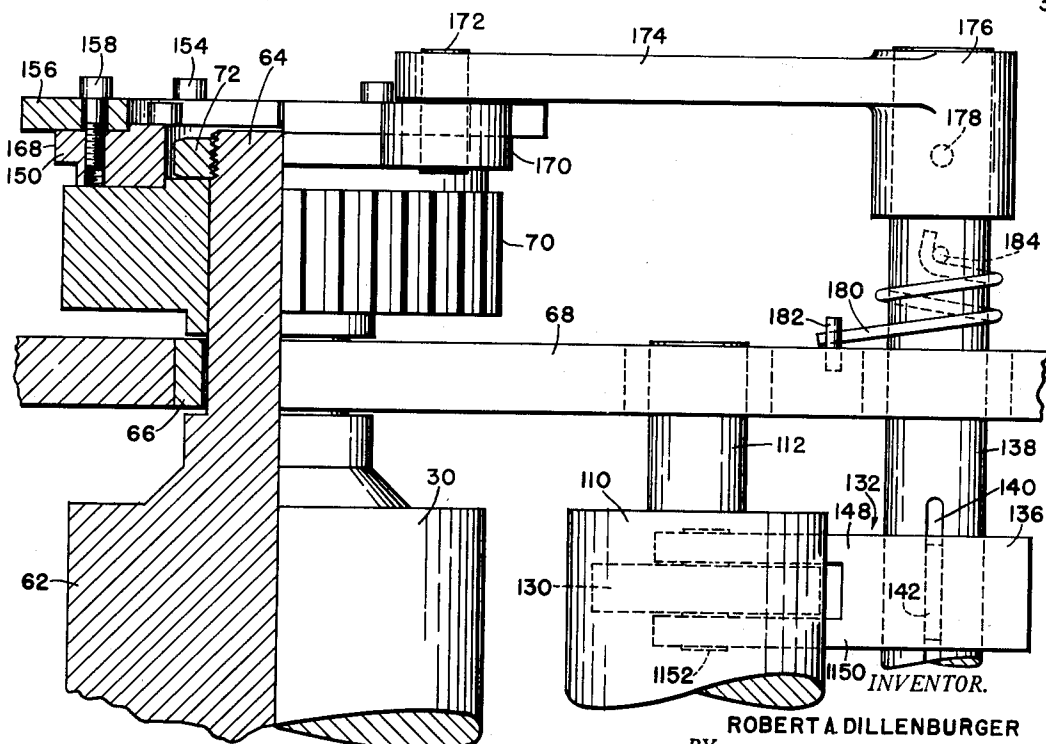
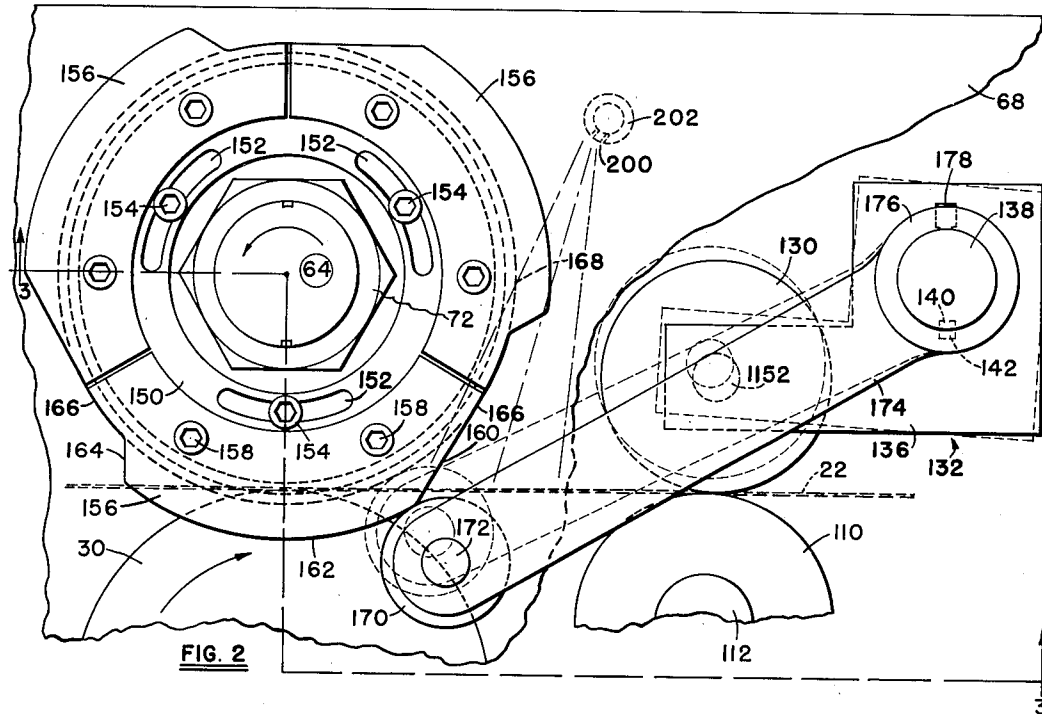
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ROTARY CUT-OFF ASSEMBLY WITH A PULL-OUT ROLL

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3 Sheets-Sheet 3

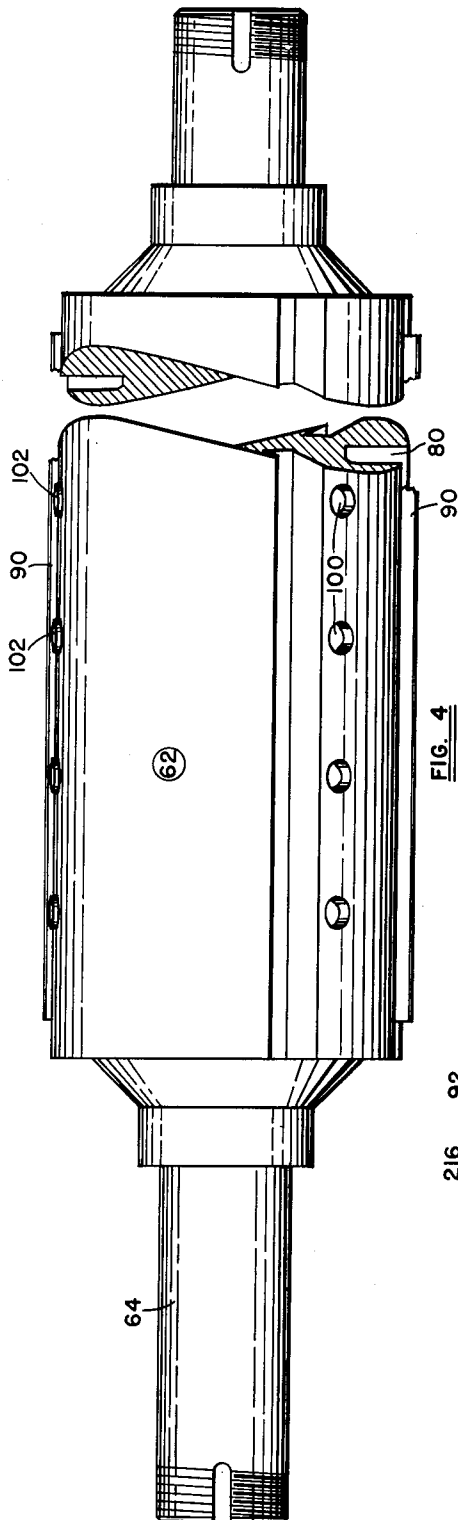


FIG. 4

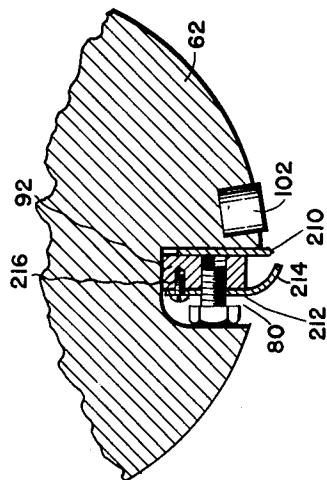


FIG. 6

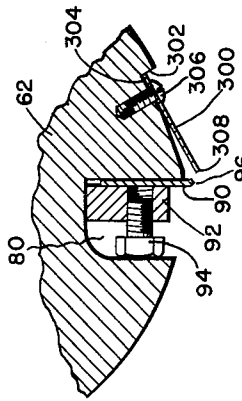


FIG. 7

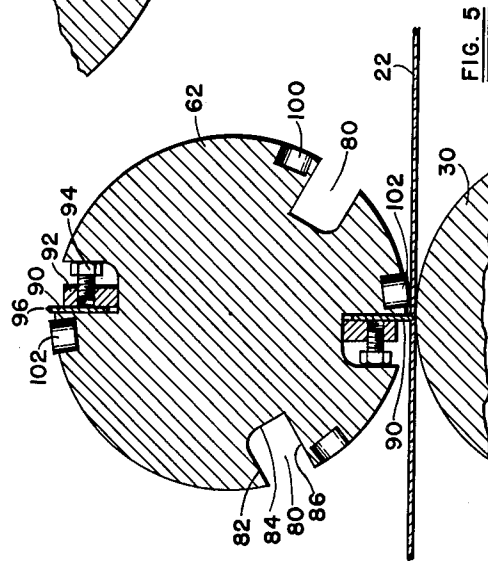


FIG. 5

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ROTARY CUT-OFF ASSEMBLY WITH A PULL-OUT ROLL

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1 Claim. (Cl. 164—201)

This invention relates to a method of and device for effecting high speed, variable-length rotary cut-off of sheet material.

An object of the invention is to provide a rotary cut-off for high speed printing presses, collators, and the like.

Another object of the invention is to provide an improved rotary cut-off multi-blade blade-cylinder.

A further object of the invention is to provide improved means for effectively precluding the adherence of sheet material being severed to the outer peripheral portions of the blade-cylinder.

Still a further object of the invention is to provide an improved, high speed rotary cut-off assembly having associated therewith a pull-out roll and means for subjecting the web of sheet material being severed to selective action of the pull-out roll for augmenting the cutting characteristics of the blades of the blade-cylinder.

Another object of the invention is to provide a device having the hereinabove described characteristics, which includes simple, yet highly effective, easily accessible means for synchronizing the operating characteristics of the pull-out roll mechanism with the cutting cycle of the blade-cylinder.

Still another object of the invention is to provide a high speed rotary cut-off, including a blade-cylinder having provided therewith means for mounting various types of cutting knives, including perforating knives, thereby greatly enhancing the utility of the device.

A further object of the invention is to provide a rotary cut-off which is simple in construction, thereby enabling it to be associated with presently existing printing presses, collators and the like at a minimum expense.

Another object of the invention is to teach a method of utilizing a rotary cut-off for high speed transverse cutting or perforation of a continuous web of sheet material.

Still another object of the invention is to provide high speed rotary cut-off or transverse perforating means which is so constructed and arranged as to sever or perforate continuous webs of material with such accuracy as to enable it to be used in association with collating and folding machines in the high speed production of business forms, and the like.

These and other object are attained by the means described herein and as disclosed in the accompanying drawings, in which:

Fig. 1 is a schematic view of my high speed, variable-length, rotary cut-off mechanism associated with the discharge end of a conventional collating machine, parts of both devices having been cut away for clarity of detail and understanding.

Fig. 2 is a fragmentary view of the opposite side of the rotary cut-off device of Fig. 1.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a side elevational view of a blade-cylinder comprising a detail of the present invention.

Fig. 5 is a sectional view through the blade-cylinder of Fig. 4, illustrating its operative relationship with a hard-

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ened bearing or anvil cylinder and a length of sheet material being passed therebetween.

Fig. 6 is a fragmentary view of a portion of the blade-cylinder of Fig. 5 illustrating the use of a perforating knife therewith.

Fig. 7 is a fragmentary view of a portion of a modified type of blade-cylinder comprising a detail of the present invention.

With reference now to Fig. 1, the numeral 20 denotes a feed table or web support onto which one or more superposed webs or strips of record material or alternate webs of record and transfer strips 22 may be suitably deposited for engagement with suitable means for imparting a uniform lineal motion thereto.

At this point it should be clearly understood that the present invention is neither directed to nor concerned with the particular manner in which the continuous strips 22 are fed onto and thence over table 20. If desired, at least one edge of certain of superposed strips 22 may be provided with a plurality of axially aligned, laterally spaced openings into which laterally spaced projections 24 of conveyor 26 project for thereby simultaneously maintaining the strips in exact registry and imparting a positive lineal motion thereto for advancing them over feed table 20 at a uniform predetermined rate.

Strips 22 are automatically disengaged from projections 24 of conveyor 26 by means of a stripper blade 28, said strips being thence fed across the top of table 29 for being subjected to the successive action of an edge-trimming rotary knife 32 and a brushing wheel 34.

The continuous composite web of sheet material 22 is then fed onto the outer periphery of a hardened bearing or anvil cylinder 30 the peripheral speed of which is substantially the same as the linear speed of web 22, by a suitable drive mechanism which may, if desired, comprise a drive gear 40 connected by a chain 42 to gear 44 mounted on rotatable shaft 46. Gear 48 is secured in fixed, driven relationship with gear 44, and drives gears 50 and 52, wherein gear 50 drives gear 54, to which sprocket wheel 56 is secured in driven relationship. Conveyor 26 may comprise an endless chain the various links of which are engageable with various sprocket teeth 58. Gear 52 is in driving relationship with gear 60 to which the bearing or anvil cylinder 30 is operatively secured.

From the foregoing it will be noted that the peripheral speeds of sprocket wheel 56 and anvil cylinder 30 will be substantially identical.

With reference now to Figs. 2 and 3, it will be noted that the tone end of blade-cylinder 62 is provided with a spindle 64 which extends through a suitable bearing 66 in side frame 68. A gear 70 is securely though releasably mounted in driving relationship with spindle 64 by means of a key, not illustrated, and a nut 72 which, as best illustrated in Fig. 3, threadably engages the outer end of the spindle.

With reference now to Figs. 4 and 5, it will be noted that blade-cylinder 62 is provided with a plurality of elongate blade receptive slots 80 provided in and extending lengthwise of the cylinder.

In the preferred embodiment of the invention, each of said blade receptive slots includes a forward face or edge 82, a bottom face or edge 84, and a rear face or edge 86 which extends radially of the cylinder.

It will be noted that the blade-cylinder disclosed in Fig. 5 has been provided with four elongate blade receptive slots, for dividing the outer periphery of the cylinder into one, two or three equal parts, thereby greatly enhancing the utility of the device by enabling the same blade-cylinder to be utilized for cutting the continuous webs of material fed thereto into various lengths which are equal to, a function of, and determined by a propor-

tionate part of the outer circumference of the blade-cylinder.

With particular reference now to Fig. 5, the numeral 90 denotes an elongated blade or knife securely though releasably received or housed within elongate slot 80 by means of an elongated clamp bar 92. A plurality of anchoring elements such as, by way of example, bolts 94, threadably engage clamp bar 92 along a common axis, said bolts being located in laterally spaced relationship.

Blade 90 is adapted to be disposed against rear face 86 of slot 80 against which it is positively maintained by means of clamping bar 92, which is urged into contacting relationship therewith incident to manipulation of bolts 94 whereby their heads are forced into abutting engagement with forward faces 82 of the slot for mounting the blade to and projecting from the slot and for disposing its outer cutting edge 96 in kissing contact with the outer periphery of the bearing or anvil cylinder 30.

At this point it should be noted that anvil cylinder 30 and blade-cylinder 62 are rotatably mounted whereby adjacent portions of their peripheral faces will be normally disposed in spaced parallelism. In the preferred embodiment of the invention such lateral spacing is of a dimension at least equal to the thickest web of material to be fed therebetween. The blade-cylinder may be driven directly from or by the anvil or hardened bearing cylinder by suitable gears 60 and 70.

In order to prevent portions of the web of material passing between cylinders 30 and 62 from adhering or tending to adhere to the periphery of the blade-cylinder, suitable means are secured to, carried by and project from the blade-cylinder along and adjacent the rear edge of slots 80. Such means may comprise resilient plugs of material fabricated, by way of example, from sponge rubber. The numerals 100 denote generally the axially aligned laterally spaced recesses provided in the outer face of blade-cylinder 62 along and in spaced relationship with rear face or edge 86 of slots 80. The numerals 102 denote the resilient plugs seated in recesses 100. Highly satisfactory results have been obtained when resilient members 102 have been secured to their respective recesses by means of adhesive.

With further reference now to Fig. 5, it will be noted that the portion of the web of material 22 between cylinders 30 and 62 is momentarily subjected to a combined severing and pinching action by knife blades 90 which crushes and weakens the web of material at the same time pulling action is exerted upon the web to sever the web along the edges of the blades and that the outer end face or surface of resilient member 102 engages the web of material immediately behind the trailing edge of blade 90, thereby positively and effectively precluding the adherence of the knife-adjacent edge of web 22 to the outer periphery of the blade-cylinder.

At this point it should be noted that any tendency for the web of material being severed to adhere to the outer periphery of a rotating cylinder, particularly a blade-cylinder, results in a chaotic condition, particularly if the web of material should tend to become wrapped around the blade-cylinder. The use of resilient means 102 will positively preclude any wrap-around of the web around the blade-cylinder.

With particular reference now to Figs. 1, 2 and 3, the numeral 110 denotes generally a so-called pull-out roll keyed to shaft 112 and laterally spanning web 22 between side walls 68 and 114 of the support frame. Suitable means are provided for rotating the pull-out roll at peripheral speeds substantially greater than the lineal speed of the web of material being fed between cylinders 30 and 62, and in excess of the peripheral speed of the anvil and blade-cylinders. The pull-out roll may be driven by gear 60 through intermediate gear 118 and gear 120.

The location of pull-out roll 110 is closely adjacent the anvil roll, with the upper periphery of the pull-out roll in substantial horizontal alignment with the upper periphery of the anvil cylinder whereby the web of material 22 passing over the anvil cylinder is discharged onto the pull-out roll.

Suitable means such as, by way of example, an endless conveyor 122 may be provided adjacent and preferably spaced somewhat below that side of the pull-out roll remote from the anvil cylinder whereby the webs of material passing over the pull-out roll will be discharged or deposited onto the upper reach 124 of the conveyor.

One or more gripper rolls or disks 130 are rotatably secured to and carried one each by a gripper head denoted generally by the numeral 132, including a horizontal leg 134 and a vertical leg 136, said vertical leg having an aperture therein for non-rotatably but slidably engaging shaft 138 which spans side walls 68 and 114 of the framework.

With particular reference now to Fig. 3, it will be noted that shaft 138 includes an elongated keyway 140 engageable by key 142, secured to and carried by leg 136 of each gripper head for facilitating axial adjustment of a gripper head relative to and along shaft 138 while securing it against relative rotation therewith.

As best illustrated in Fig. 3, the horizontal legs 134 of the gripper head are bifurcated for providing a pair of laterally spaced legs 148 and 1150 between which a gripper roll or disk 130 is pivotally mounted about shaft 1152 which spaningly engages legs 148 and 1150.

The purpose of gripper rolls 130 is to force or press the web of material leaving cylinders 30 and 62 against pull-out roll 110 for the purpose of accelerating the web by imparting to it a lineal speed approximating the peripheral speed of the pull-out roll. It should be understood that several gripper head assemblies, each including a roll or disk 130, may be disposed on shaft 138 in laterally spaced relationship.

The gripper head shaft 138 is caused to oscillate in predetermined synchronization with the cutting cycle of the blades of the blade-cylinder for imparting a cyclic rate of operation to the gripper rolls.

A cam ring 150 which includes a plurality of arcuate, circumferentially spaced elongated slots 152 is mounted to the outer face of drive gear 70 by means of bolts 154, which extend through slots 152.

One or more cams 156 may be secured to cam ring 150 by fastening elements, such as bolts 158. In Fig. 2, three such cams have been illustrated, it being noted that the number of cams utilized will be a function of the number of blades carried by the blade-cylinder. Each cam includes an inclined forward surface 160, a camming surface 162, a trailing edge 164 and a lower edge 166. In the preferred embodiment of the invention lowermost edge 166 of the cam is located on a radius substantially equal to the radius of outer circular edge 168 of the cam ring, for a reason hereinafter more fully explained.

A cam follower 170 is pivotally secured as at 172 to the free outer end of an actuating lever 174 the other end of which terminates in a boss 176 which engages the free outer end of shaft 138 to which it may be fixedly secured by means of set screw 178. Suitable means such as a spring 180 may be provided for normally urging the free outer end of actuator arm 174 upwardly for shifting gripper roll 130 to the fully elevated position, indicated by the dotted lines in Fig. 2, in laterally spaced relationship with pull-out roll 110. One end of spring 180 may be disposed beneath pin 182 projecting from frame 68, whereas the other end of the spring may engage pin 184 projecting from shaft 138.

From the foregoing it will be noted that shaft 138 is normally urged in a clockwise direction, with reference to Fig. 2, thereby normally elevating actuator arm 174 and the gripper heads 132.

Cams 156 should be adjusted so that the gripper roll

or disks 130 will be lowered into contacting relationship with the pull-out roll 110 at the instant a knife blade 90 is on dead center, that is, in kissing relationship with anvil 30 in which it pinches and grips the web of material, see Fig. 5. The cam adjustment may be effected by loosening bolts 154, thereby facilitating rotation of the entire cam ring 150 relative to the end of its mounting gear 70.

In those instances where two or more cams are secured to and carried by the cam ring manipulation of the ring will enable the operator to accurately and simultaneously set all of the cams in one operation.

With reference now to Fig. 1, it will be noted that gripper roll 130 has been depressed against the counter-force of spring 180 into lowered engagement or operative relationship with pull-out roll 110 thereby forcing the web of material against and in driven relationship with the pull-out roll for accelerating the rate of lineal travel of the web of material in advance of knife blade 90. By thus suddenly accelerating the web concurrently with the severing or pinching action of blade 90, a neat, clean, transverse severance of the web of material is effected accompanied by an immediate high speed forward discharge of the severed length of material onto upper reach of conveyor 122.

In the preferred embodiment of the invention I prefer to utilize the auxiliary means in the form of an air blast from nozzles or apertures 200 provided in an air tube 202 disposed forwardly of, adjacent and in substantial parallelism with the blade-cylinder. The blast of air discharged from nozzles 200 serves to lower the forward edge of the web of material being discharged from between cylinders 30 and 62 after each cutting cycle for thereby insuring proper alignment and insertion of the forward edge of the web between the laterally spaced pull-out roll 110 and the gripper roll or disks 130, it being noted that the gripper roll or disks are elevated after each web severing-accelerating cycle.

In those instances wherein it is desired to cross-perforate continuous webs of material, the blades 90 may be removed from slots 80 and replaced with elongated perforating blades 210. An elongated resilient strip 212, including an outturned lip 214 along one edge, is secured as by means of fasteners 216 to the forward face of clamp bar 92, wherein lip 214 will project along and outwardly from the outer periphery of the blade-cylinder and extend rearwardly toward the leading side of the perforating blade 210.

It will be noted that lip 214 is normally disposed forwardly of, that is, beyond the free outer edge of perforating blade 210, it being further noted that the free outer edge of this blade is adapted to make kissing contact with the outer periphery of anvil cylinder 30.

During those periods of time when the perforating blade is in perforating position, that is, in dead center relationship with the anvil cylinder, lip 214 will be deflected upwardly by the anvil cylinder during the perforating operation of blade 210. However immediately upon movement of blade-cylinder beyond its dead center, perforating position, lip 214 will flex outwardly for thereby positively withdrawing from the blade any web material which would otherwise tend to catch upon the perforating blade. Resilient members 102 are likewise utilized for precluding adherence of the perforated web immediately behind the perforating blade.

By comparing Fig. 6 with Fig. 5 it will be seen that the strip 212 may be used in conjunction with blade 90 as well as with blade 210, it being merely necessary to form threaded openings in the bar 92 in order to receive the screws 216 which secure the strip 212 against the forward side face of the bar.

From the foregoing it will be noted that I have thus provided simple yet highly effective means along and adjacent the leading and trailing sides of a blade adapted to engage and laterally displace the web of material from en-

gagement with the periphery of the blade cylinder after said web has been subjected to the perforating or cutting action of the blades.

It should be understood that when a perforating blade is utilized the pull-out roll assembly is not used, since to subject the transversely perforated web to the action of the pull-out roll would result in severance of the web at each row of perforations. The pull-out roll assembly may be quickly rendered inoperative by removing the cams from the cam ring whereby the cam follower will ride upon outer edge 168 of the cam ring for disposing the gripper roll or disks 130 in raised, inoperative position.

It will likewise be noted that during those periods of time when a fewer number of cams 156 are mounted to the cam ring than are required to completely cover the outer face of said ring follower 170 will ride upon outer edge 168 of the cam ring, which as hereinabove pointed out, is on the same radius as lower cam surface 166.

With reference now to Fig. 7, it will be noted that an elongated spring stripper strip or tucker blade 300 has been utilized in lieu of the resilient stripping members 102. The rear edge of the strip may be received within and against rear edge or wall 302 of an elongated notch 304 and secured thereto by means of a plurality of axially aligned laterally spaced fasteners 306 for disposing forward edge 308 rearwardly of and closely adjacent the trailing edge of blade 90, as illustrated.

The free outer end of the stripper strip or tucker blade will be deflected toward the outer periphery of the cylinder incident to the cutting action of the blade after which it will spring outwardly for radially displacing the web of material from the trailing edge of the blade and from the periphery of the blade cylinder adjacent thereto.

It should be understood that various changes in the structural details of the device may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

An apparatus for successively severing end sections from a continuous composite web consisting of alternate strips of record and transfer material comprising a rotary cylinder constituting a continuous anvil, a rotary blade-carrying cylinder disposed close to and spaced from said anvil by a dimension at least as great as the overall thickness of the composite web and rotating at the same surface speed as the anvil, a blade carried by said blade-carrying cylinder and projecting radially therefrom and moving forwardly with the blade-carrying cylinder into and out of position for momentary contact with a portion of the composite web between the cylinders, means spaced rearwardly from the cylinders for advancing the web forwardly between the anvil and blade-carrier at the same speed the blade moves forwardly with the anvil, a lower pull-out roll spaced forwardly from said cylinders rotatably mounted in stationary bearings and rotating at a higher peripheral speed than said cylinders, gripper disks disposed above said pull-out roll, means for shifting the gripper disks toward and away from the pull-out roll comprising a rocker shaft, a plurality of brackets rigidly carried by said rocker shaft and having portions extending over the pull-out roll, each bracket rotatably supporting a gripper disk, spring means engaged with the rocker shaft and serving to turn the rocker shaft in a direction urging the gripper disks from the pull-out roll to an elevated inoperative position, a lever extending laterally from the rocker shaft, a cam secured relative to the blade cylinder and rotating therewith, a cam follower on said lever engaging said cam for moving the lever against the counterforce of said spring means to shift the gripper disks toward the pull-out roll as the blade moves into contact with the web, said pull-out roll and gripper disks constituting the sole means exerting a forward pull upon the web for severing the web along the contacting edge of the blade.

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