May 3, 1966 R. B. ST. DENNY ET AL 3,248,983

PAPER ROLL CONVERTER MECHANISM

Filed Sept. 5, 1963 5 Sheets-Sheet 1

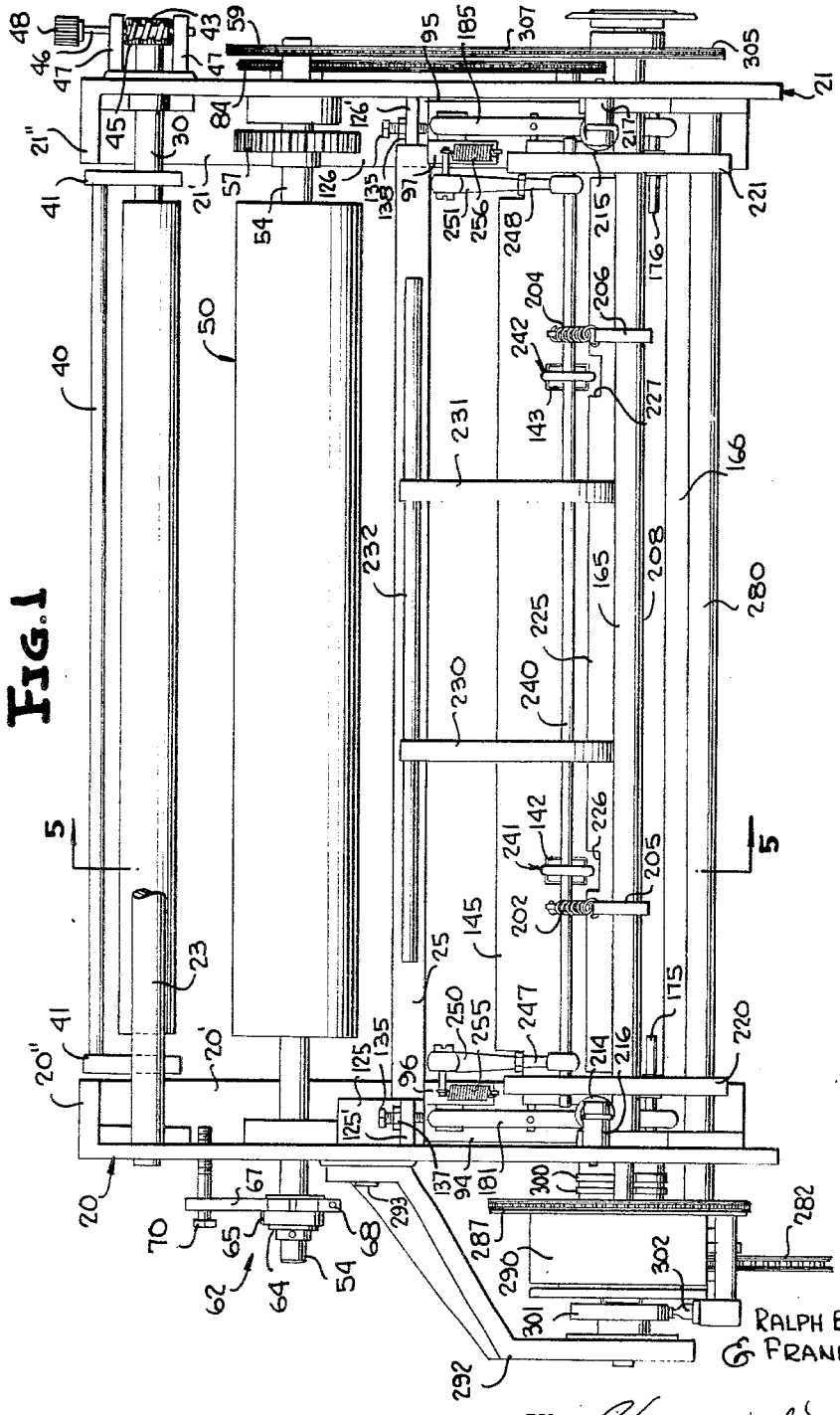


FIG. 1

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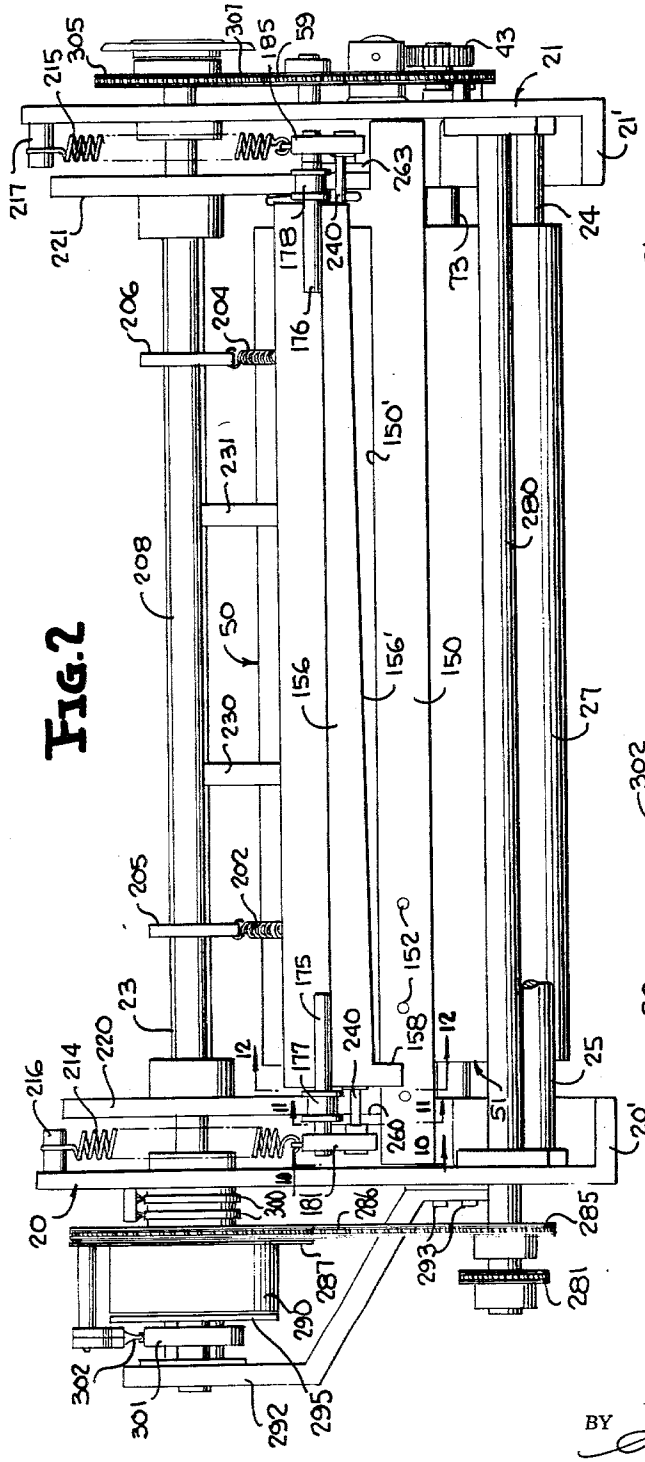


FIG. 2

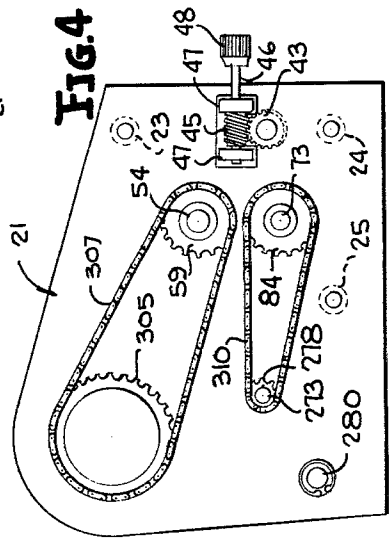


FIG. 4

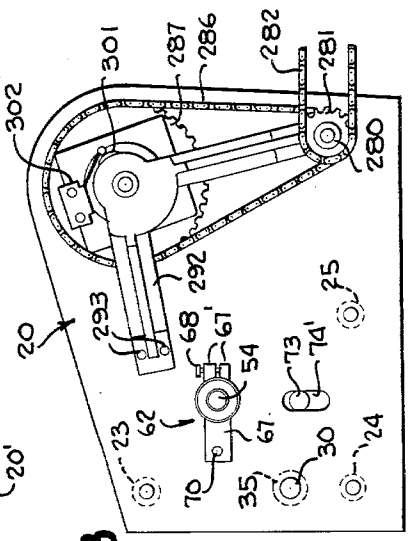


FIG. 3

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FIG. 5

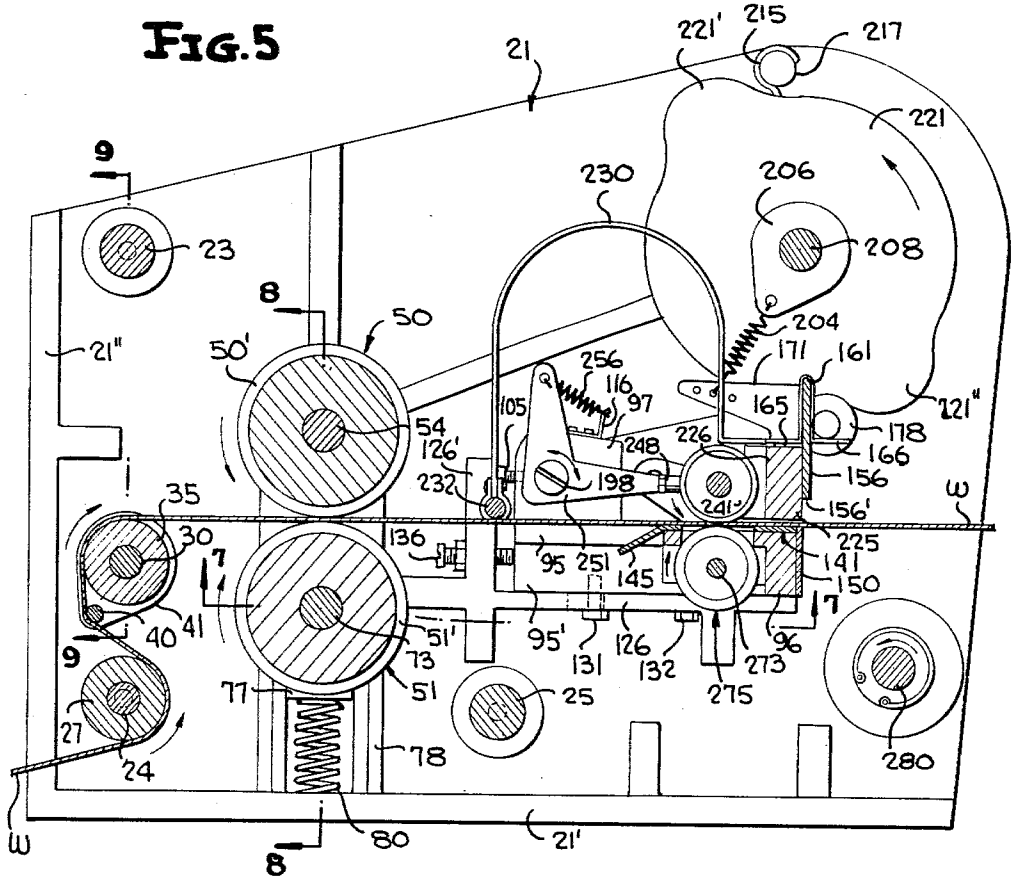
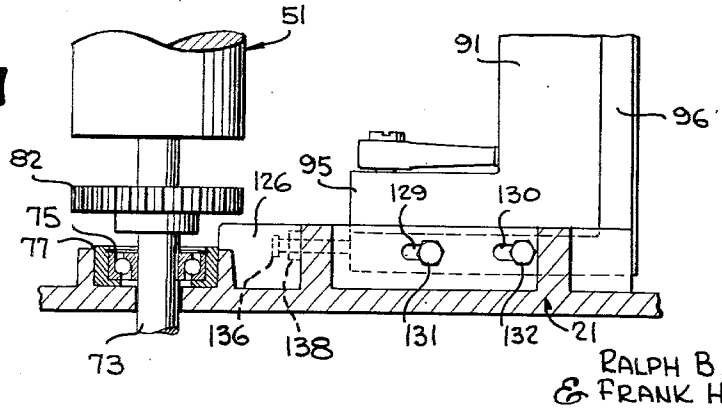


FIG. 7



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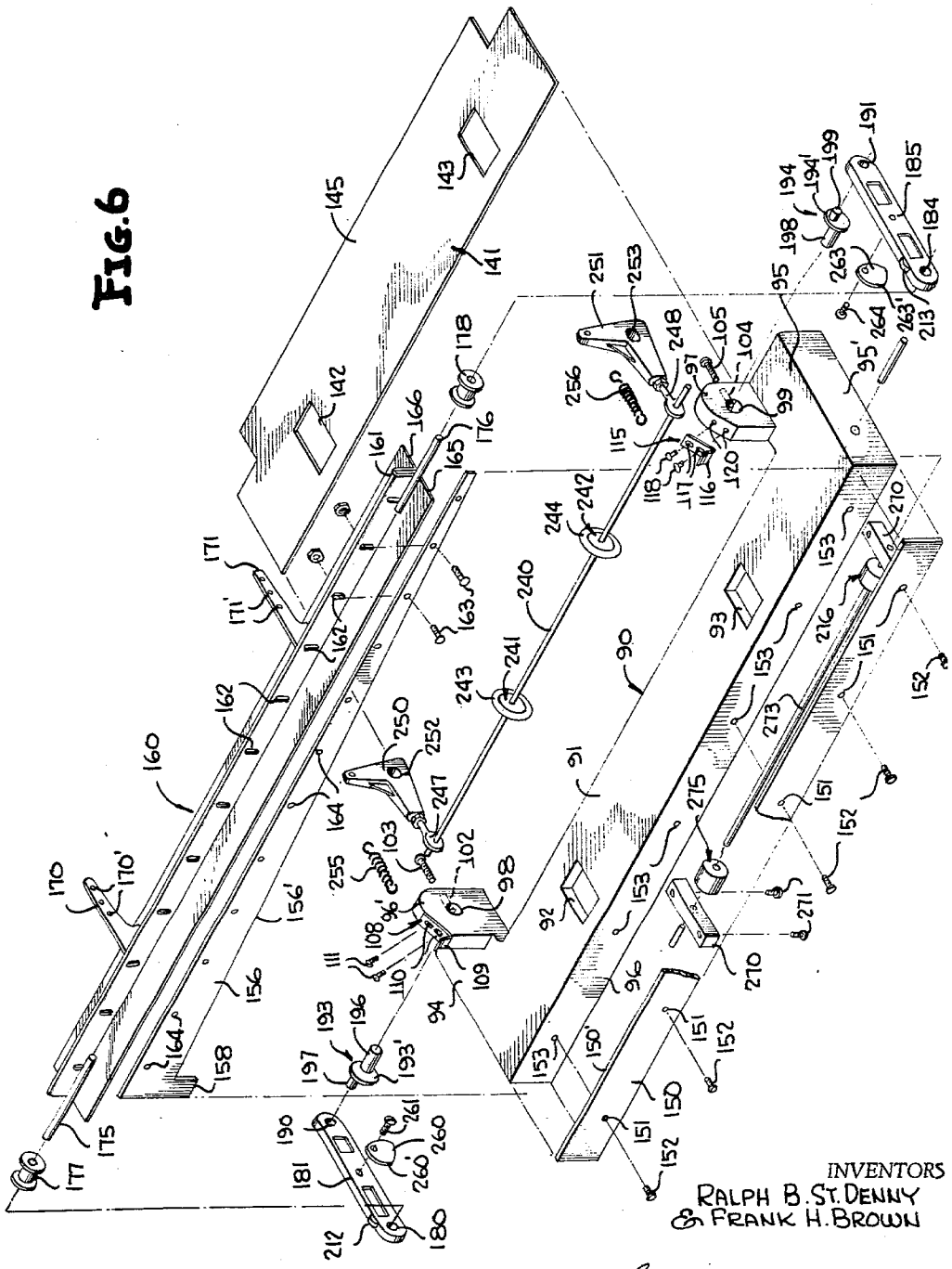
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FIG. 6



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PAPER ROLL CONVERTER MECHANISM

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FIG. 8

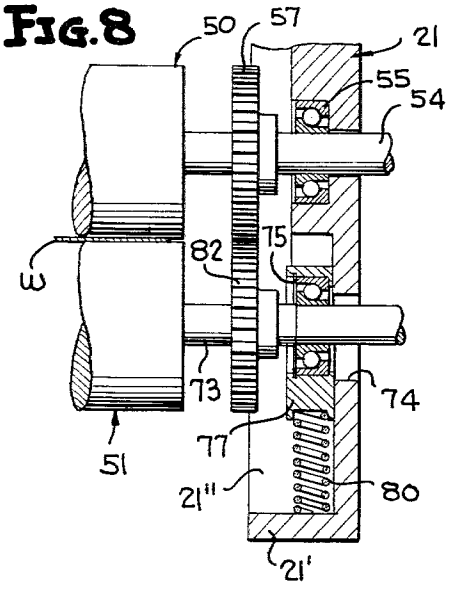


FIG. 9

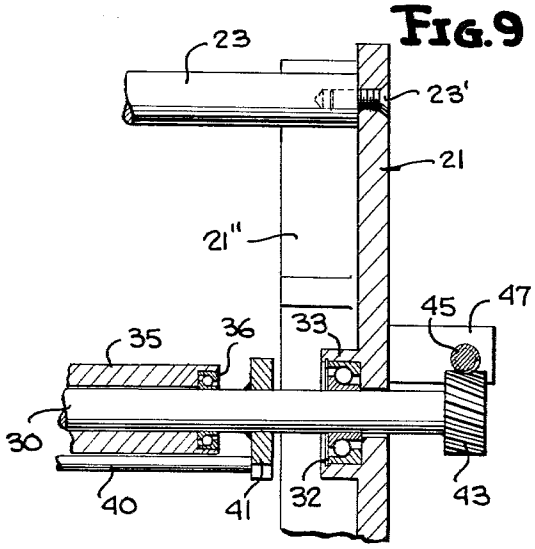


FIG. 10

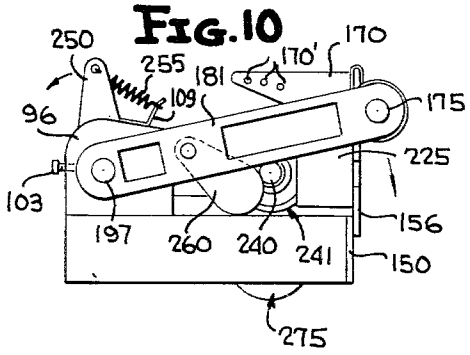


FIG. 11

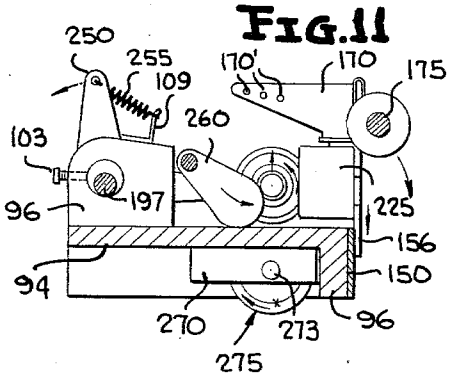
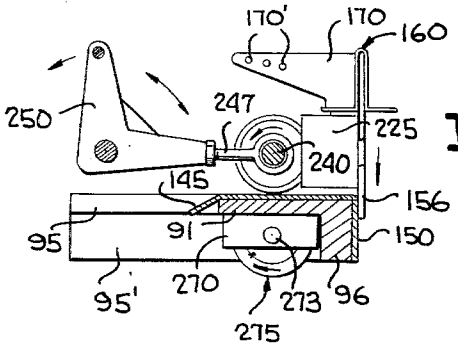


FIG. 12



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United States Patent Office 3,248,983 Patented May 3, 1966

3,248,983

PAPER ROLL CONVERTER MECHANISM

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Filed Sept. 5, 1963, Ser. No. 306,788
11 Claims. (Cl. 83—225)

The present invention relates to new and novel paper roll converter apparatus, and more particularly to apparatus for cutting off predetermined discrete lengths of paper from a continuous web roll, these discrete lengths of paper then being fed into a printing press and the like.

The present invention is particularly adapted for use with printing presses, and the primary purpose of this type of apparatus is to reduce the cost of the paper used with conventional printing presses. Pre-cut paper is more expensive than paper in roll form, and accordingly utilization of this type of paper roll converter apparatus results in substantial savings in the over-all cost of the printing operation.

A number of prior art devices have been designed for the purposes of the present invention, and the apparatus as disclosed herein represents an improvement over co-pending U.S. patent application Serial No. 176,214, filed February 28, 1962, now abandoned.

As disclosed in the aforementioned copending application, roll converter apparatus of this nature includes means for supporting a continuous web roll of paper, and suitable feed means is provided for dereeling the paper from the roll, means being provided for obtaining the desired degree of tautness of the web as well as guidance thereof and feedback to the dereeling mechanism so as to maintain a substantially uniform rate of feed to the cutting mechanism of the apparatus. The present invention may utilize dereeling mechanism as disclosed in the aforementioned copending application or various other types of known dereeling mechanisms may be employed, the improvement of the present invention lying in the feed means and cutting mechanism disposed closely adjacent to and cooperating with the feed means at one end of the apparatus.

The present invention as well as the apparatus shown in aforementioned copending application, Ser. No. 176,214, each serve to cut a continuous web of paper into predetermined lengths while a press may be continuously fed, the paper feed being capable of being started or stopped while the press is going at full speed and also allowing the press speed to be altered rapidly while feeding paper. The utilization of apparatus according to the present invention increases the press efficiency and permits the press to be converted from sheet feed to roll feed and vice versa in the minimum amount of time since the apparatus of the present invention can be quickly and easily set up in position to feed a press from a continuous web roll.

In contrast to the intermittent feed drive which has been employed in certain prior art apparatus and in the structure shown in the aforementioned copending application, the present invention utilizes a continuous drive to the feed roll means and speed wheel means of the invention, provision being made for cutting the paper web only when it is at rest which ensures that a uniform cut will be obtained in each case.

Means is also provided in the present invention whereby the length of the cut off pieces of paper may be readily adjusted within relative wide limits.

The provision of a continuous drive to the feed roll means and the speed wheel means of the present invention is of great importance since it eliminates the necessity of rapidly starting and stopping and components involved in these means which avoids the shock and wear and tear which has been observed to occur to a great degree on mechanisms which are required to rapidly start and stop during operation of the apparatus.

The feed roll means of the present invention are continuously positively driven so as to urge the web of paper toward the cutting mechanism at all times. The speed wheel means of the present invention is driven continuously at a peripheral speed substantially greater than that of the feed roll means for a purpose which will hereinafter appear. At least one portion of this speed wheel means is also movable toward and away from the web of paper for a purpose hereinafter explained.

The cutting means of the present invention is mounted in a unique manner such that a fixed cutting portion is provided and a movable cutting portion is provided which is mounted upon support means which is swingably supported by the support structure. Accordingly, the movable portion of the cutting means is mounted upon support structure which is swingably mounted, and further the movable cutting portion is mounted for rotation with respect to its support means, means being provided for normally resiliently urging the movable cutting portion in one direction of rotation with respect to its support means.

Clamping means is also associated with the movable cutting portion such that when the movable cutting portion is moved downwardly toward the fixed cutting portion so as to cut off a predetermined length of paper, the clamping means engages the upper portion of the web of paper so as to hold this web at this point so that there is no movement of the web in the area where the movable cutting portion cooperates with the fixed cutting portion to cut off an individual sheet of paper.

An important aspect of the present invention is the fact that when the clamping means holds the web of paper, the feed roll means is continuously driving the web toward the clamping means such that an excess amount of paper will accumulate in the area between the feed roll means and the cutting means.

This is specifically compensated for by providing a dipper means which moves downwardly with the cutting means so as to cause the paper to form a depending loop between the feed roll means and the cutting means.

Additionally, means is provided for lifting off a portion of the speeder wheel means from contact with the web of paper just after the paper is engaged by the clamping means. This prevents inertia of the speeder wheel means from wrinkling the paper just behind the clamping means which would prevent the paper from being driven out properly. On the other hand, the speeder wheel means is returned into engagement with the paper web just before the web is released by the clamping means, this action assuring that there is no slippage of the paper and that the paper is maintained taut between the speeder wheel means and the feed roll means.

It is accordingly apparent that there is a unique and novel intercooperation between the feed means and the cutting means which serves to effectively enable the cutting means to cut the web while the portion to be cut is at rest while a continuously driven feed means is provided which forms a loop of paper between the feed roll means and the cutting means, the speeder wheel means serving to take up the slack or loop in the paper after the cutting operation has been completed. The speeder wheel means must of course be driven at a substantially greater peripheral speed than the feed roll means, and the speed is adjusted such that the loop of paper will be caught up during approximately half a sheet feed.

The size of the sheets cut off may be adjusted in a most simple manner simply by adjusting the driving means in the form of a chain or the like which drives the feed roll means, or in other words the speed of rotation of the feed

roll means can be adjusted so as to vary the amount of loop which accumulates between cutting strokes of the cutting and clamping mechanism thereby serving to vary the amount of paper which is fed forwardly by the speeder wheel means and cut off upon each subsequent cutting cycle.

The cutting means and the feed means are driven in timed relationship with respect to one another, the various components being interconnected by positive driving mechanism which ensures that they remain in the proper timed relationship, and cam means is provided for causing operation of the cutting means and the speeder wheel means in proper sequence to obtain the desired end results.

The cutting means also includes a novel arrangement whereby the force tending to rotate the movable cutting portion in one direction with respect to its support means is modulated whereby the force becomes greater as the movable cutting portion moves downwardly and contacts and cooperates with the fixed cutting portion.

The feed roll means of the present invention are supported such that one of the feed roll means is disposed for rotation about a fixed axis, the other feed roll means being mounted for rotation about an axis which is movable toward and away from the fixed axis. The second feed roll means is actually mounted in slide blocks which are movably supported by the associated support structure, resilient means being provided for urging the second feed roll means toward the first speed roll means. This resilient means assures that the two feed roll means will be maintained in good driving contact with opposite sides of the paper web at all times. In addition, a one-way brake mechanism is operatively associated with the feed roll means so as to permit driving movement thereof in only one direction this making it impossible to feed the paper in a reverse direction or to let the web back out of the feeding rolls.

A decurling mechanism is also provided for decurling the web, the amount of curl in the paper web varying as the size of the roll from which the web is fed decreases. Accordingly, the decurling mechanism is provided with means for adjusting the mechanism whereby it can be varied in position to compensate for the amount of curl in the web.

An object of the present invention is to provide new and novel paper roll converter apparatus for cutting a continuous web of paper into predetermined discrete lengths while continuously feeding a press and permitting the paper feed to be started or stopped while the press is going at full speed and also allowing the press speed to be altered rapidly while feeding paper.

Another object of the invention is the provision of paper roll converter apparatus which increases press efficiency and permits a press to be converted from sheet feed to roll feed and vice versa in a minimum amount of time.

A further object of the invention is to provide paper roll converter apparatus wherein the paper is cut only when the web is at rest in the area of the cut such that a uniform square cut will be obtained each time.

Still another object of the invention is the provision of paper roll converter apparatus wherein the length of the cut off pieces of paper may be adjusted in a simple manner and within relatively wide limits.

Another object of the invention is the provision of paper roll converter apparatus wherein the various driving elements are continuously rotated thereby eliminating rapid starts and stops of the various driving components and auxiliary mechanism to avoid shock and wear and tear on these components.

A further object of the invention is to provide paper roll converter apparatus including an adjustable decurler mechanism for taking out the curl of the paper web.

Still another object of the invention is the provision of paper roll converter apparatus employing a cutting mechanism which is supported for swinging movement to obtain a swinging action which is very efficient, and furthermore wherein the movable cutting portion of the cutting mechanism is normally rotated in one direction and the force tending to rotate the movable cutting portion in such direction is modulated in a particular manner.

A further object of the invention is to provide paper roll converter apparatus including means for preventing wrinkling of the paper adjacent the clamping means thereof and further to prevent slippage of paper between the feed mechanism and the cutting mechanism.

And yet a further object of the invention is the provision of paper roll converter apparatus wherein the above objects may be successfully accomplished while employing a structure which is quite simple and inexpensive in construction, and yet which at the same time is compact and efficient in operation.

Other objects and many attendant advantages of the invention will become more apparent when considered in connection with the specification and accompanying drawings, wherein:

FIG. 1 is a top view of a preferred modification of the present invention;

FIG. 2 is a front view of the structure shown in FIG. 1;

FIG. 3 is a side view looking at one end of the structure shown in FIG. 1;

FIG. 4 is a side view looking at the opposite end of the structure shown in FIG. 1 from that illustrated in FIG. 3;

FIG. 5 is a sectional view taken substantially along line **5—5** of FIG. 1 looking in the direction of the arrows;

FIG. 6 is a top exploded perspective view illustrating certain components of the apparatus;

FIG. 7 is a sectional view taken along line **7—7** of FIG. 5 looking in the direction of the arrows;

FIG. 8 is a sectional view taken substantially along line **8—8** of FIG. 5 looking in the direction of the arrows;

FIG. 9 is a sectional view taken substantially along line **9—9** of FIG. 5 looking in the direction of the arrows;

FIG. 10 is a sectional view taken substantially along line **10—10** of FIG. 2 looking in the directon of the arrows;

FIG. 11 is a sectional view taken substantially along line **11—11** of FIG. 2 looking in the direction of the arrows; and

FIG. 12 is a sectional view taken substantially along line **12—12** of FIG. 2 looking in the direction of the arrows.

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, a pair of opposite side castings **20** and **21** are provided, casting **20** including a lower integral flange portion **20'** which extends horizontally of the casting and a rear vertically extending integral flange portion **20''**. In a like manner, casting **21** includes a lower horizontally extending integral flange portion **21'** and a vertically extending integral flange portion **21''**.

The side castings are maintained in rigid spaced relationship with one another by three transversely extending reinforcing bars or members **23**, **24** and **25**. Each of these laterally extending reinforcing bars is drilled and tapped at the opposite end thereof and secured to its associated side castings by means of screws which extend through suitable openings provided in the side castings. For example, as seen in FIG. 9, one end portion of the transversely extending reinforcing bar **23** is illustrated as being rigidly connected with side casting **21** by means of screw **23'**.

As seen particularly in FIGS. 5 and 9, a pair of idler rolls **27** and **35** are provided, idler roll **27** being suitably journalled as by means of ball bearings and the like on the reinforcing transverse bar **24**, idler roll **35** being rotatably supported as by means of ball bearings **36** on a transversely extending shaft **30** which is in turn journalled within suitable ball bearings disposed within bosses provided in the opposite side castings. As seen in FIG. 9,

one end of the shaft 30 is journalled within a ball bearing 32 provided in a boss 33 inside casting 21, it being understood that similar structure may be provided in the opposite side casting 20.

As seen in FIG. 5, the continuous web of paper or similar material is indicated by letter W, and as noted this web of paper is fed under idler roll 27 and thence upwardly and over idler roll 35. As mentioned previously various types of suitable mechanism may be provided for dereeling the continuous web from a roll of paper and the like and for advancing it to the position illustrated in FIG. 5 from whence it is in turn fed in timed relationship to the cutting means of the apparatus by the feed means hereinafter described. As the paper enters the apparatus as seen in FIG. 5 from a large roll, it will have a certain amount of curl therein which is inherent to the material due to the fact that it has been tightly rolled up and stored for some time. It is accordingly desirable to provide means for decurling the web of material, and furthermore this decurling means should be adjustable in order to compensate for varying degrees of curl which will occur as the large roll from which the material is being fed decreases in size.

The adjustable decurling mechanism of the present invention includes a transverse member 40 the opposite ends of which are connected with members 41 which are rigidly secured to spaced portions of shaft 30 and extend radially outwardly thereof. Shaft 30 extends outwardly through the side casting 21 and has a gear 43 connected with the end thereof which engages and cooperates with a worm member 45 fixed to a shaft 46 which is in turn journalled within laterally extending members 47 extending outwardly of side casting 21. A knurled knob member 48 is connected to the outer end of shaft 46, and it is apparent that rotation of knob 48 will cause rotation of shaft 30 in movement of the transverse member 40 through an arc. Movement of member 40 through an arc will as seen in FIG. 5 cause it to move to different positions for removing a varying amount of curl from the web of material. The position of member 40 can accordingly be adjusted to compensate for the amount of curl existing at any particular time during the operation of the apparatus.

As seen most clearly in FIG. 5, a pair of feed roll means are provided including an upper feed roll indicated generally by reference numeral 50 and a lower feed roll indicated generally by reference numeral 51. These feed rolls preferably include outer peripheral portions 50' and 51' formed of rubber or a similar resilient substance which is adapted to effectively drive the web of material therebetween. The inner portion of the roll may be either of solid construction or tubular and may be formed of a suitable material such as aluminum or the like. It will of course be understood that the idler rolls previously described can be of either tubular or relatively solid construction as is conventional in the art.

Feed roll 50 is mounted upon a transverse shaft 54 which is journalled by suitable means such as ball bearings in the opposite side castings, and as seen for example in FIG. 8, the shaft is journalled in ball bearings 55 mounted in side casting 21, a similar arrangement being provided in side casting 20. A gear member 57 is fixed to shaft 54 for a purpose hereinafter described. Shaft 54 also extends outwardly of side casting 21 and is fixed to a driving sprocket member 59 which may be seen most clearly in FIG. 4 of the drawings.

In addition, as seen in FIGS. 1 and 3 of the drawings, shaft 54 extends outwardly of side casting 20 at the opposite end of shaft 54 from the driving sprocket 59, and is connected to a one-way brake mechanism indicated generally by reference numeral 62. The one-way brake is of conventional construction and includes an inner race 64 and an outer race 65 which may have so-called sprags mounted therebetween so as to permit the inner race to rotate in only one direction with respect to the outer race. The inner race is suitably fixed as by a pin or the like to the shaft 54, while the outer race is fixed to a casting 67 which is split at one end thereof to provide space portion 67'. A screw member 68 is threaded into suitable threaded openings provided in the two split portions 67' and screw 68 is adapted to clamp the split casting 67 on the outer race of the one-way brake mechanism. Casting 67 is fixed against rotation with respect to the casting 20 by means of a screw member 70 which extends through a suitable opening provided in casting 67 and is threaded into a suitable opening provided in the side casting 20. It is apparent that the one-way brake mechanism will permit feed roll 50 to rotate only in one direction which is in the driving direction as indicated by the arrow in FIG. 5 thereby preventing the web of material from being fed in a reverse direction or to back out of the feed roll means.

It is apparent that the feed roll 50 is mounted for rotation about a fixed axis, whereas the feed roll 51 on the other hand is mounted for rotation about an axis which is movable with respect to the fixed axis of feed roll 50. In the case of the feed roll 51, it is mounted for rotation about a shaft 73 the opposite ends of which are similarly mounted, and one of the end mountings of the shaft is illustrated in detail in FIG. 8, it being understood that a similar mounting is provided in the opposite side casting. As seen in FIG. 8, shaft 73 extends through a slot 74 provided in side casting 21, a similar slot 74' being provided in the opposite side casting 20 as illustrated in FIG. 3.

Referring again to FIG. 8, shaft 73 is journalled within a suitable bearing means such as a ball bearing 75 which is mounted within a slide block 77. Slide block 77 is in turn guided for vertical movement by means of a vertically extending boss 78 formed integral with the side casting as seen particularly in FIG. 5, a compression spring 80 being disposed between the bottom flange 21' of the side casting and the undersurface of the slide block 77. It is evident that the spring 80 at each side casting will resiliently urge the shaft 73 as well as the associated feed roll 51 in an upward direction so as to resiliently grip the web of material between the outer peripheries of the feed rolls.

A gear member 82 is fixed to shaft 73 as seen in FIG. 8 and meshes with gear 57 fixed to shaft 54. It is accordingly apparent that the two feed rolls 50 and 51 are positively geared to one another and furthermore the gears 57 and 82 serve as positive drive means in the drive chain which will be hereinafter described. As seen in FIG. 4, a drive sprocket 84 is fixed to the outer end of shaft 73.

Referring now particularly to FIG. 6 of the drawings, a cutting means support casting is illustrated generally by reference numeral 90 and includes a main transverse extending body portion 91 within integral rearwardly extending portions 94 and 95 at opposite ends of the main body portion. The main body portion 91 is provided with a pair of substantially rectangular cutout portions 92 and 93 which extend therethrough for a purpose hereinafter described. The undersurface of the casting 90 is cut away so as to define the depending forward portion 96 as well as the depending portions at opposite ends of the casting, one of these depending portions being illustrated by reference numeral 95'. It will be understood that a corresponding depending portion will be provided at the opposite end portion 94 of the casting.

A pair of upwardly extending ear portions 96' and 97 are formed integral with portions 94 and 95 respectively and have openings 98 and 99 formed therethrough. A threaded opening 102 is provided in member 96' and intersects the opening 98, opening 102 being adapted to receive a set screw 103 for a purpose hereinafter described. In a similar manner, member 97 is provided with a threaded opening 104 adapted to receive a set screw 105, opening 104 intersecting with opening 99 as hereinafter explained.

The upper surfaces of members 96' and 97 slope forwardly, and the upper surface of member 96' is adapted to support a bracket member 108 having an upwardly projecting attaching portion 109 with a hole therethrough for a purpose hereinafter described. Member 108 is provided with a pair of slots 110 adapted to receive screws 111, these screws being adapted to be threaded into corresponding threaded openings provided in the upper surface of member 96'. This arrangement permits adjustment of bracket member 108 as hereinafter explained.

A bracket member 115 substantially identical with bracket member 108 is provided with an upwardly projecting attaching portion 116 with an opening therethrough, and a pair of slots 117 are adapted to receive screw members 118 which are adapted to be threaded into the openings 120 provided in the upper surface of member 97. This arrangement also permits ready adjustment of the position of bracket member 115.

The inner surfaces of side castings 20 and 21 respectively are provided with inwardly extending horizontal support portions 125 and 126 respectively, these portions being formed integral with the casting, and vertically extending portions 125' and 126' extend upwardly from the portions 125 and 126 respectively. The support portions 125 and 126 serve to support the cutting means support casting 90, each of the support portions 125 and 126 being provided with a pair of slots formed therethrough. As seen in FIGS. 5 and 7, support portion 126 is provided with a pair of slots 129 and 130 which receive screw members 131 and 132 which extend upwardly through the slots and are threaded into corresponding openings provided in the depending portion 95' provided at one end of the casting 90. It will be understood that similar screws extend upwardly into the depending portion corresponding to portion 95' at the opposite end of the casting. These screw members serve to retain the casting in secure fixed relationship on the support portions 125 and 126.

As seen most clearly in FIG. 1, a pair of adjusting screws 135 and 136 are threaded through suitable threaded openings provided in the support portions 125' and 126' formed integral with castings 20 and 21 respectively, these adjusting screws being adapted to engage the rear faces of the portions 94 and 95 respectively of the cutting means support casting 90. A pair of lock nuts 137 and 138 are provided on adjusting screws 135 and 136 respectively for locking the screws in the proper operative adjusted position. These adjusting screws are utilized for accurately adjusting the position of casting 90 so as to permit squaring of the cut end of the material being cut by the cutting means.

As seen most clearly in FIG. 6, a tray means is indicated generally by reference numeral 141, the tray means including a pair of substantially rectangular cutout portions 142 and 143 which are adapted to be aligned with openings 92 and 93 in casting 90, the tray being adapted to rest upon and be supported by the casting and secured thereto by any suitable means such as screws or the like (not shown). The tray also includes a rearwardly extending downwardly sloping lip portion 145 which as seen most clearly in FIG. 5 will permit the web of material to drop downwardly to form a loop, and further which facilitates initial threading of the paper web into the portion of the apparatus adjacent to the tray and the cutting means hereinafter described.

The cutting means of the present invention includes a lower blade or cutting portion 150 as seen most clearly in FIG. 6 which has an upper cutting edge 150'. A plurality of holes 151 are provided through the cutting portion 150, and a plurality of screw members 152 are adapted to the inserted through holes 151 and threaded into holes 153 provided in the forward face of the cutting means support casting 90. It is apparent that the blade 150 will remain in fixed position on the casting 90 once the casting has been fixedly adjusted with respect to the side casting portions of the support structure.

The cutting means also includes a movable upper cutting portion or blade 156 having a lower cutting edge 156'. Upper blade 156 includes at one end thereof a depending portion 158 which is adapted at all times to engage the forward face of the lower fixed cutting blade 150 so as to prevent the upper blade means from being pivoted excessively in one direction as will hereinafter appear. It will be noted that the lower cutting edge of blade 156 slopes upwardly from left to right as seen in the front view shown in FIG. 2 of the drawings, while the upper cutting edge of the lower blade 150 is disposed substantially horizontally. Accordingly, upon downward movement of the upper blade in the cutting stroke of the apparatus, a shearing action will be obtained which is quite efficient in cutting a web of paper and the like.

An upper blade or cutting portion holder is indicated generally by reference numeral 160 as seen in FIG. 6 and includes a substantially U-shaped central portion 161 which is adapted to rather snugly receive the upper blade 156 therewithin. The opposite side legs of the U-shaped portion 161 are provided with aligned slots 162, and when the blade 156 is inserted in operative position within the U-shaped portion, nut and bolt assemblies 163 extend through slots 162 and aligned openings 164 are provided in blade 156 for securing the blade in operative position within the holder 160.

Oppositely extending flange portions 165 and 166 extend outwardly from the central U-shaped portion. A pair of spaced bracket members 170 and 171 are rigidly secured to one side leg of the U-shaped portion 161 of the holder and extend outwardly a substantial distance therefrom. Bracket member 170 has a plurality of spaced openings 170' formed therethrough and bracket member 171 has a plurality of spaced holes 171' formed therethrough.

A pair of outwardly extending shaft members 175 and 176 are rigidly secured to the holder 160 at the intersection of the portions 161 and 165 thereof, shaft portions 175 and 176 extending lengthwise of the holder and outwardly from opposite ends thereof. A pair of cam follower members 177 and 178 are rotatably journalled on shaft portions 175 and 176 for a purpose hereinafter described.

Shaft portion 175 is rotatably journalled within an opening 180 provided in the outer end of a cutting means support means or arm 181, while shaft portion 176 is rotatably journalled within an opening 184 formed in the outer end of a member 185 similar to member 181.

The opposite ends of arms 181 and 185 are provided with holes 190 and 191 respectively. A pair of arm support members 193 and 194 are provided, these members including central substantially disc-like portions 193' and 194' respectively. Member 193 includes a shaft portion 196 extending from the central portion of one side of the disc portion 193' and substantially concentric with the disc portion 193'. A shaft portion 197 extends from the opposite side of the central disc portion 193' and is disposed eccentrically with respect to shaft portion 196. In a similar manner, member 194 includes a shaft portion 198 extending from the central side of the disc portion 194' thereof and a shaft portion 199 extends from the opposite side thereof and is eccentric with respect to the shaft portion 198.

Arms 181 and 185 are journalled respectively on shaft portions 197 and 199, while shaft portions 196 and 198 are respectively supported within the holes 98 and 99 of the ears 96' and 97. The support members 193 and 194 permit adjustment of the pivot portion of the arms 181 and 185 respectively such that the swinging movement of the movable cutting portion of the cutting means may be adjusted by altering the pivot axis of either of the arms 181 and 185. The members 193 and 194 are retained in their operative adjusted position by means of set screws 103 and 104 respectively.

It is evident that since the upper blade holder 160 is

rotatably supported in the opposite ends of arms 181 and 185, the upper movable cutting portion is swingably supported with respect to the support structure. In addition, the upper movable cutting portion is mounted for rotation with respect to its support means in the form of arms 181 and 185. Resilient means is provided for pivoting the holder 160 and the upper blade 156 toward the lower blade portion about a pivot axis extending through the openings 180 and 184 of the arms 181 and 185. This resilient biasing means comprises a pair of spring members 202 and 204 which are connected respectively with one of the holes provided in the bracket members 170 and 171, spring members 202 and 204 being tension springs and having the opposite ends thereof connected with members 205 and 206 which are rotatably supported on a cross shaft 208 the purpose of which will hereinafter be described. These springs 202 and 204 will normally tend to rotate the upper blade 156 toward the lower blade thereof such that as it swings downwardly about the pivot axis of arms 181 and 185, it can also rotate with respect to these arms. The tension of these springs 202 and 204 can be adjusted by connecting them with different holes 170' and 171' respectively. A further feature of this arrangement is the fact that as the blade descends, the force that the springs 202 and 204 apply to rotate the upper blade means as discussed above increases which is desirable, whereas this force decreases on the upstroke of the movable cutting member thereby providing a desired degree of modulation of the spring force tending to rotate the upper cutting portion.

Referring again to FIG. 6, it will be noted that the upper surface of arms 181 and 185 is provided with an eye portion 212 and 213, respectively, these eyes receiving the lower ends of tension springs 214 and 215 respectively, the upper ends of these springs being connected with posts 216 and 217 repectively which extend inwardly from the side castings 20 and 21. Tension springs 214 and 215 normally bias the support arms 181 and 185 in an upward direction so as to move the movable blade portion 156 of the cutting means away from the fixed blade portion 150.

In order to urge the support arms 181 and 185 and the associated cutting blade 156 downwardly in timed relationship to the movement of the other components, a pair of operating cams 220 and 221 are provided, these cams being fixed to shaft 208. Cams 220 and 221 engage the spool cam followers 177 and 178 respectively for urging the holder 160 and the connected components downwardly. As seen particularly in FIG. 5, the cam 221 includes opposite lobes 221' and 221", and when the follower 178 rides up upon these lobes, the upper blade is moved downwardly in its cutting stroke. During the remainder of the cutting cycle when the follower 178 is riding on the lower portions of cam 221, the springs 214 and 215 urge the upper blade 156 upwardly and out of cutting relationship with respect to the lower fixed cutting blade 150.

Referring now particularly to FIGS. 1 and 5 of the drawings, a clamping means includes a member 225 secured to the blade holder and depending from the flange portion 165 thereof immediately rearwardly of the upper cutting blade 156. Member 225 may be formed of a suitable resilient material for gripping the web of paper, and in a preferred modification is formed of sponge material. This clamping member is provided with a pair of cutout portions 226 and 227 for providing clearance with the speeder wheel means hereinafter described.

Also as seen particularly in FIG. 5, a dipper means includes a pair of spaced resilient spring members 230 and 231 supported by the holder means 160 and having a transversely extending rod 232 extending between the opposite ends thereof. This dipper means moves downwardly with the upper cutting blade and holder upon the cutting stroke of the apparatus, and as seen in FIG. 5, it is apparent that the end portions of members 230 and 231 which support the cross member 232 will engage the upper surface of the web of material within the apparatus and will force it downwardly so as to form a depending loop of material as hereinafter more fully described.

Idler speed wheel means includes a shaft 240 having wheel members 241 and 242 mounted thereon, these wheels in turn having outer peripheries of resilient material which may take the form of O-rings 243 and 244 mounted on the outer periphery of the wheel members. The opposite ends of the shaft 240 are supported within members 247 and 248 which in turn are fixed to one leg portion of the L-shaped crank members 250 and 251.

Members 250 and 251 are provided respectively with holes 252 and 253 which are rotatably journalled upon shaft portions 196 and 198 of the support members 193 and 194. A first tension spring member 255 is connected between portion 109 of bracket 108 and the upper end of member 250, and a similar tension spring member 256 is connected between the upwardly extending portion 116 of bracket member 115 and the upper end of member 251. These tension springs normally pivot the members 250 and 251 about their shaft portions 196 and 198 respectively so as to move the idler speed wheels 241 and 242 downwardly into engagement with the upper surface of a web of material extending through the apparatus. It will be understood that wheels 241 and 242 are free idling wheels and do not transmit any drive nor do they place any drag on the web, but merely serve to urge the web into engagement with the driver speed wheels hereinafter described.

A cam member 260 is secured to support arm 181 by means of a screw member 261, cam member 260 including an upper cam surface 260' which is adapted to engage the under surface of shaft 240 which extends outwardly a substantial distance beyond the support member 247. A similar cam member 263 is mounted by means of a screw member 264 on the support arm 185, cam member 263 including an upper cam surface 263' adapted to engage the under surface of the portion of the shaft 240 which extends outwardly beyond the support portion, as hereinafter more fully described.

Referring again to FIG. 6, a pair of support members 270 of similar construction are secured to the under surface of the casting 90 by means of screws 271 extending through suitable openings provided in members 270 and being threaded into corresponding openings provided in the casting 90. Support members 270 are provided with aligned openings which rotatably journal a shaft 273 to which are fixed the driver speed wheels 275 and 276. As seen in FIG. 4, a sprocket member 278 is fixed to the outer end of shaft 273. The driver speed wheels 275 and 276 are adapted to engage the under surface of the web of material passing through the apparatus, these speed wheels extending upwardly through the cutout portions 92 and 93 of the casting 90 and the cutout portions 142 and 143 of tray 141. The speed wheels 275 are preferably formed as solid steel rollers in order to cooperate with the upper idler speed wheels previously described.

Referring now particularly to FIGS. 1, 2, and 3, a main drive shaft 280 is rotatably journalled by suitable means such as ball bearings in the opposite side castings 20 and 21 and extends laterally outwardly of casting 20. A sprocket member 281 is secured to the outer end of shaft 280 and is connected by means of a chain or the like 282 with a suitable driving source such as a press or the like. In a typical example, the converter may be run at about one-half the speed of the press which accounts for the fact that two lobes are provided on the cams 220 and 221 such that the cutting mechanism will be operated in proper timed relationship.

A second sprocket 285 is secured to shaft 280 and is connected by means of a driving chain 286 with a sprocket 287 which is fixed to a clutch body 290 freely rotatably journalled on the cross shaft 208. The outer end of shaft 208 may be journalled in a side casting member 292

which is suitably secured to the outer surface of side casting 20 by bolt means 293 and the like.

Clutch body 290 may comprise a portion of any suitable clutch mechanism or similar arrangement for selectively connecting the sprocket 287 with shaft 208. In the particular example illustrated, the clutch means is of the electromagnetic type including portions 290 and 295, a pair of slip rings 300 being provided for supplying electrical energy to the clutch means. A cam 301 is mounted on shaft 208, and a microswitch 302 supported by portion 290 is adapted to ride on the outer surface of cam 301. The clutch portions are interengaged for driving relation with one another upon an electrical signal from a switch provided on an associated press, and the microswitch and cam 302 and 301 respectively cooperate to ensure that engagement is effected at the proper time. Upon engagement of the clutch, shaft 208 will be positively driven through the aforementioned drive chain.

A sprocket 305 is fixed to the opposite end of shaft 208 and as seen in FIG. 4 is drivingly connected with sprocket 59 by means of a drive chain 307. This driving connection in turn causes positive driving of the two feed rolls 50 and 51 through the intermediary of the gears 57 and 82 thereof which in turn transmits drive to the sprocket 84. Sprocket 84 is drivingly interconnected with sprocket 278 by means of a drive chain 310 as seen in FIG. 4, thereby providing a positive drive to the driver speed wheel shaft 273.

Operation

The drive chain 282 will continuously drive shaft 280 through sprocket 281, and drive chain 286 will in turn be driven by sprocket 285 fixed to shaft 280 and will continuously drive the clutch member 290 through the intermediary sprocket 287. Upon a suitable signal from the associated printing press, the electromagnetic clutch will be engaged to cause clutch member 295 to be engaged with clutch 290 and thereby cause continuous rotation of cross shaft 208. Shaft 208 will then drive sprocket 305 and through drive chain 307 will drive sprocket 59 and the upper feed roll 50. The upper feed roll will in turn drive the lower feed roll through the intermediary of gears 57 and 82. Sprocket 84 fixed to shaft 73 upon which gear 82 is fixed then in turn drives through drive chain 310 the sprocket 278 fixed to the lower speed wheel shaft 273.

Accordingly, when the clutch means is engaged, shaft 208 carrying the cams 220 and 221 continuously rotates as do both of the feed roll shafts and the associated feed rolls as well as the lower driving speed wheel rollers 275 and 276. All of these components are positively driven through the various driving connections hereinbefore described.

The components are shown in their operative position as seen in FIG. 5 when the cam followers 177 and 178 are riding on the lower part of the cams 220 and 221 respectively and the movable upper cutting blade 156 is in its upper position. The feed rolls 50 and 51 and the speed wheel means 241, 242 and 275, 276 are continuously rotating in the direction indicated by the arrows in FIG. 5 so as to feed the web of material toward the cutting mechanism.

Cams 220 and 221 continuously rotate in the direction of the arrow as shown in FIG. 5, and while the cam followers are on the lower part of the cams, the springs 215 retain the support arms 181 and 185 in their elevated position. The springs 255 and 256 bias the arms 250 and 251 such that the speed wheels 241 and 242, which are the idler wheels, are engaged with the upper surface of the web of material.

When the cam followers ride up on one of the lobes of the cams 220 and 221, the knife holder 221 is forced downwardly carrying the upper knife blade downwardly and in a swinging movement about the pivot axes of arms 181 and 185. The clamping means 225 in the form of resilient sponge material or the like engages the upper surface of the web of material and clamps it between member 225 and the tray member 141. Further downward movement of the upper cutting blade will cause compression of the clamping member 225, this member being sufficiently resilient as to compress to a sufficient degree such as to allow the upper cutting blade to complete its cutting stroke and to completely shear the material of the web in cooperation with the fixed lower cutting blade.

As the support arms 181 and 185 move downwardly and the web material is engaged by the clamping means, the cam members 260 and 263 approach the under surface of the opposite ends of the idler speed wheel shaft 240. The cams are so adjusted that they engage the opposite ends of shaft 240 and lift the upper speed wheels 241 and 242 off of the material of the web just after the web is engaged by the clamping means.

The springs 202 and 204 will continually bias the upper cutting blade in the particular direction of rotation with respect to the support arms 181 and 185. Also, as the upper cutting portion swings downwardly, the dipper means will engage the upper surface of the web material and urge it in a downward direction.

After the upper cutting portion has reached the limit of its downward movement, it will ride down off the top part of one of the cam lobes whereupon the upper cutting blade will again be urged upwardly by the springs 214 and 215. As the arms 181 and 185 accordingly move in an upward direction, the cam members 260 and 263 will allow the upper speed wheels to re-engage the upper surface of the web material under the influence of springs 255 and 256. The cams are so adjusted in this respect that the upper speed wheels are returned into engagement with the material of the web just before the web material is released by the clamping means 225.

It will be noted that upon the downward movement of the upper cutting blade and engagement of the clamping means 225 with the upper surface of the web material, the web is stopped at the clamping portion and the upper speed wheels move out of engagement with the web material, but the feed rolls continue to drive the web continuously. Accordingly, during the time that the clamping means is in engagement with the web material, an excess amount of material will accumulate between the feed rolls and the clamping means, and this excess material will form a depending loop under the influence of the dipper means previously described.

Upon re-engagement of the speed idler wheels with the upper surface of the web, and upon release of the clamping means, the excess material of the loop will quickly be caught up to again ensure that the paper is in a taut horizontal position between the feed rolls and the cutting mechanism. This is due to the fact that the peripheral speed of the speed wheel means is considerably greater than that of the feed rolls. The peripheral speed of the speed wheels is preferably adjusted such that the speed wheels will catch up the accumulated loop developed during the cut off portion of the cycle of operation of the apparatus in approximately half a sheet feed.

It is apparent that various adjustments may be made in the apparatus in accordance with the foregoing discussion, and furthermore the length of the cut off individual sheets of material may be adjusted in a simple manner simply by changing the drive ratio between sprockets 305 and 59. In other words, different sprockets and drive chain arrangement may be employed for obtaining the desired ratio of drive between these members so as to adjust the operating speed of the feed rolls.

It is apparent from the foregoing that there is provided according to the present invention new and novel paper roll converter apparatus for cutting a continuous web of material into predetermined lengths while continuously feeding the press and permitting the paper feed to be started or stopped while the press is going at full speed

and also allowing the press speed to be altered rapidly while feeding paper. Paper roll converter apparatus of this nature increases the press efficiency and permits the press to be converted from sheet feed to roll feed and vice versa in a minimum amount of time. The paper is cut by the cutting mechanism only when the paper web adjacent the cutting portions is at rest thereby ensuring a uniform square cut each time. At the same time, although the web is stopped by the resilient clamping means, the feed rolls and the speed wheel means are continuously rotated thereby avoiding rapid starting and stopping of these components and their auxiliary mechanisms which prevents excessive shock and wear and tear to thsese components. The driving mechanism also includes a means for simply and easily adjusting the length of the cut off pieces of paper within relatively wide limits. The apparatus includes an adjustable decurler mechanism for eliminating the curl of the paper web. A unique cutting arrangement is provided wherein a fixed cutting portion is provided and a movable cutting portion is provided, the movable cutting portion having a swinging action wherein the support for the movable cutting portion is swingable about a first axis and the movable cutting portion is additionally rotatable about an axis with respect to the support means therefor. This particular type of cutting action results in a very efficient and effective cut of the paper. The cutting mechanism additionally includes spring means which normally biases the movable cutting portion in one direction of rotation with respect to its support means, this spring means providing a modulated force to the movable cutting portion such that the force is increased upon the down stroke of the cutting means which ensures that the upper movable cutting portion is biased with more force against the lower fixed cutting portion during the cutting stroke, while this force is decreased upon the up stroke of the movable cutting portion. The interrelationship of the cutting means including the clamping mechanism and the speed wheel feed means is such that wrinkling of the paper is prevented when the clamping means engages the paper and the speed wheel means lifts off of the paper immediately thereafter, and further the speed wheel means again re-engages the paper prior to lift-off of the clamping means thereby assuring no slippage of the paper. The structure of the apparatus is additionally relatively simple and inexpensive in construction and quite compact, and yet at the same time is efficient and reliable in operation.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

We claim:

1. Apparatus for converting a continuous web of sheet material into individual predetermined lengths of material comprising material feed means including first and second feed roll means for receiving the web of material therebetween and for moving said web of material in a particular direction, cutting means disposed in position to receive the web of material fed by said first and second feed roll means and for cutting the web of material into individual lengths of material, and first and second speed wheel means interposed between said first and second feed roll means and said cutting means for receiving therebetween the web of material fed by said feed roll means and for moving said web of material in said particular direction, means continuously driving said feed roll means so as to move said web in said particular direction, means continuously driving at least a portion of said speed wheel means for driving said web in said particular direction, said cutting means including a pair of separate cutting portions at least one of which is movable toward and away from the other cutting portion, and clamping means operatively connected with said movable cutting portion for engagement with the web of material upon movement of said movable cutting portion toward said other cutting portion during the cutting stroke of the apparatus, support means for at least one of said speed wheel means, said support means being movably mounted and means normally urging said support means in one direction to move said speed wheel means toward one another, a pair of cam members operatively connected with said movable cutting portion of the cutting means, said support means including a shaft extending outwardly on either side of the associated speed wheel means, said cam members being engageable with opposite end portions of said shaft upon movement of said movable cutting portion of the cutting means toward the other portion of the cutting means to move said one speed wheel means away from the other speed wheel means.

2. Apparatus as defined in claim 1 including dipper means operatively connected with and carried by said movable cutting portion and movable therewith upon movement of said movable cutting portion toward said other cutting portion for engaging the web of material and creating a loop therein during the cutting stroke of the apparatus.

3. Paper roll converter apparatus comprising feed means for feeding a continuous web of paper in a particular direction, and cutting means disposed in such position as to receive the web of paper fed by said feed means and for cutting the web into a plurality of discrete lengths of paper, first and second feed roll means for receiving the web of paper therebetween and for feeding the web in a particular direction, means for continuously driving said feed roll means in one direction, said cutting means including a fixed cutting portion and a movable cutting portion, cutting means support means for supporting said movable cutting portion, said cutting means support means being swingably mounted for movement about an axis, said movable cutting portion being mounted for rotation with respect to said cutting means support means, and resilient means normally urging said movable cutting portion in one direction of rotation with respect to said cutting means support means and increasing the force causing rotation upon movement of said movable cutting portion toward said fixed cutting portion, and further decreasing the force causing rotation upon movement of the movable cutting portion away from said fixed cutting portion thereby providing a desired degree of modulation of the force tending to rotate said movable cutting portion clamping means operatively connected with said movable cutting portion for movement into engagement with the web of paper upon movement of said movable cutting portion toward said fixed cutting portion during the cutting stroke of the apparatus, first and second speed wheel means for receiving the web of paper therebetween and interposed between said first and second feed roll means and said movable cutting portion, said speed wheel means including an idler speed wheel means and a driving speed wheel means, means for continuously driving said driving speed wheel means, means supporting said idler speed wheel means for movement toward and away from said driving speed wheel means, means normally urging said idler speed wheel means toward said driving speed wheel means, and means operatively connected with said cutting means support means and movable therewith for moving said idler speed wheel means away from said driving speed wheel means upon movement of said movable cutting portion toward said fixed cutting portion during the cutting stroke of the apparatus, said driving speed wheel means being driven at a greater peripheral speed than the peripheral speed of said first and second feed roll means, said driving speed wheel means being mounted for rotation about a fixed axis.

4. Apparatus as defined in claim 3 wherein said mov-

able cutting portion includes a lower cutting edge, and said clamping means is formed of resilient material and extends below said cutting edge for engaging the web of paper before it is contacted by said cutting edge.

5. Apparatus as defined in claim 3 including one-way brake means operatively associated with said feed roll means for permitting rotation of said feed roll means in only one direction.

6. Apparatus as defined in claim 3 including decurler mechanism comprising a transverse member for engaging the web of paper, and means for moving said transverse member through an arc so as to adjust for varying degrees of curl in the web of paper.

7. Paper roll converter apparatus for converting a continuous web of paper into a plurality of discrete lengths of paper comprising a support structure, first and second feed roll means supported by said support structure for rotation with respect thereto, said feed roll means being adapted to receive the web of paper therebetween for feeding the paper in a particular direction, means for continuously driving said feed roll means for moving said web in said particular direction, cutting means including a lower cutting portion supported in fixed relationship with respect to said support structure, said cutting means also including a movable cutting portion supported for movement with respect to said support structure, said fixed cutting portion extending transversely with respect to the movement of said web of paper in said particular direction and being supported beneath the web of paper as it passes through the apparatus, cutting means support means for movably supporting said movable cutting portion, said cutting portion being normally supported above said fixed cutting portion, said cutting means support means being swingably mounted with respect to said support structure, resilient means connected between said support structure and said cutting means support means for normally urging the cutting means support means in a direction to move said movable cutting portion away from said fixed cutting portion, cam means for urging said movable cutting portion downwardly toward said fixed cutting portion during the cutting stroke of the apparatus, said movable cutting portion being mounted for rotation about an axis with respect to said cutting means support means, resilient means normally urging said movable cutting portion in one direction of rotation about said axis with respect to said cutting means support means, said movable cutting portion including a lower cutting edge, said fixed cutting portion including an upper cutting edge, and clamping means operatively connected with said movable cutting portion and extending downwardly below said lower cutting edge of the movable cutting portion such that the clamping means is adapted to engage the upper surface of the web of paper prior to the cutting edge of the movable cutting portion engaging the web, dipper means operatively connected with said movable cutting portion and being disposed between said feed roll means and said cutting portion for engaging the upper surface of the web of paper upon downward movement of said movable cutting portion during the cutting stroke of the apparatus, and speed wheel means including first idler speed wheel means and second driving speed wheel means for receiving the web of paper therebetween, said speed wheel means being interposed between the feed roll means and the movable cutting portion and the fixed cutting portion of said cutting means, means for driving said driving speed wheel means at a greater peripheral speed than said feed roll means, said driving speed wheel means being mounted for rotation about a fixed axis, said driving speed wheel means being continuously driven, said idler speed wheel means being mounted for rotation about a second axis, said second axis being movable so as to move said idler speed wheel means away from and toward said driving speed wheel means, means normally urging said idler speed wheel means toward said driving speed wheel means for engaging the upper surface of the paper web, and cam means operatively connected with said cutting means support means and movable therewith, said last-mentioned cam means being adapted to engage a portion of said idler speed wheel means for urging said idler speed wheel means away from said driving speed wheel means to disengage the paper web upon downward movement of said movable cutting portion and said clamping means.

8. Apparatus as defined in claim 7 including decurler mechanism comprising a transverse member supported by said support structure and adapted to engage said web, and means for moving said transverse member with respect to said support structure for compensating for varying degrees of curl in the web.

9. Apparatus as defined in claim 8 including a pair of idler rolls over which the web passes prior to entering between said feed roll means, said decurler mechanism being mounted for engagement with said web at a point intermediate said idler rolls.

10. Apparatus as defined in claim 7 wherein said first feed roll means is mounted for rotation about an axis which is fixed with respect to said support structure, said second feed roll means being mounted for rotation about an axis which is movable with respect to said first axis, said second feed roll means being supported by slide blocks, said slide blocks being slidably mounted by said support structure, and resilient means normally urging said slide blocks in one direction so as to move said second feed roll means toward said first feed roll means.

11. Apparatus as defined in claim 7 including one-way brake means operatively connected with said feed roll means for permitting movement of said feed roll means in only one direction.

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