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Faltin

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[54] **AUXILIARY CUT-OFF UNIT FOR WEB PRINTING PRESSES AND METHOD OF FORMING SEVERED PIECES**

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[52] **U.S. Cl.** **270/21**; 83/287; 83/76

[51] **Int. Cl.**[2] **B41F 13/56**

[58] **Field of Search** 270/21; 83/349, 76, 287

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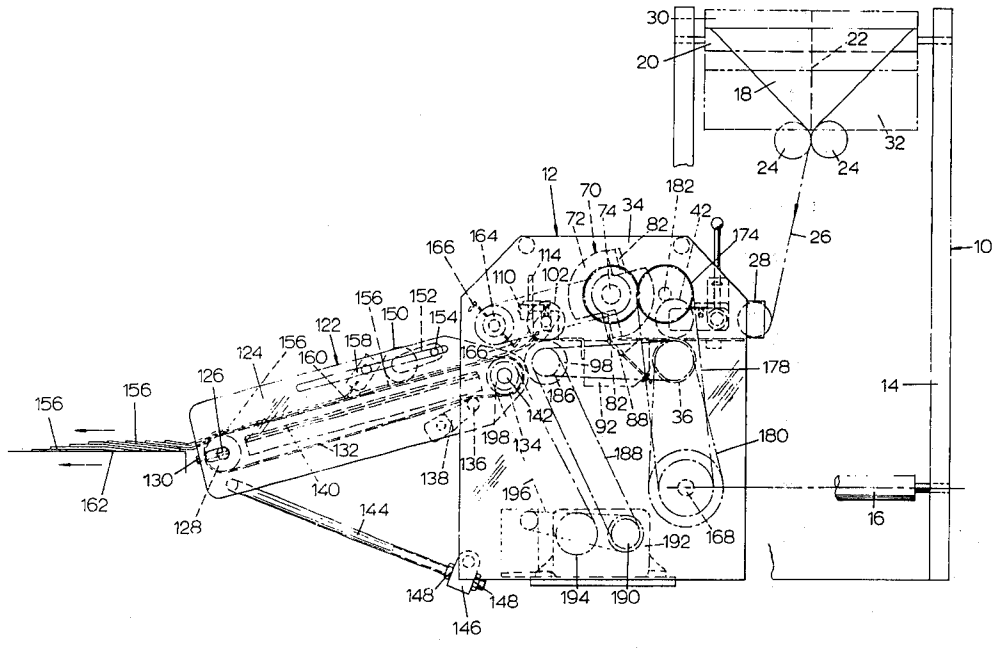
[57] **ABSTRACT**

Auxiliary cut-off unit capable of receiving either single or multiple, laminated pre-printed webs, either flat or longitudinally folded by an existing press former, or former or "plow" added thereto, and cutting said pre-printed product into various divisible lengths of the circumference of the rotary printing cylinder, generally referred to in the trade as the "repeat length" of the press. Said cut-off unit is driven directly from the main press drive for operation in direct linear relation thereto, and embodies a rotary blade cylinder in which one or more blades are secured for shearing coaction with a fixed bed blade against which the rotary blades sever said pre-printed web or webs. Adjustable means for driving said rotary blade cylinder at a selected adjustable speed permits changes in cut-off length of the severed pieces by dividing the press "repeat length" into quarters, thirds, halves, two-thirds, etc. thereof. Severed product pieces of even lengths and having smoothly cut edges require no additional trimming or finishing operations.

7 Claims, 5 Drawing Figures



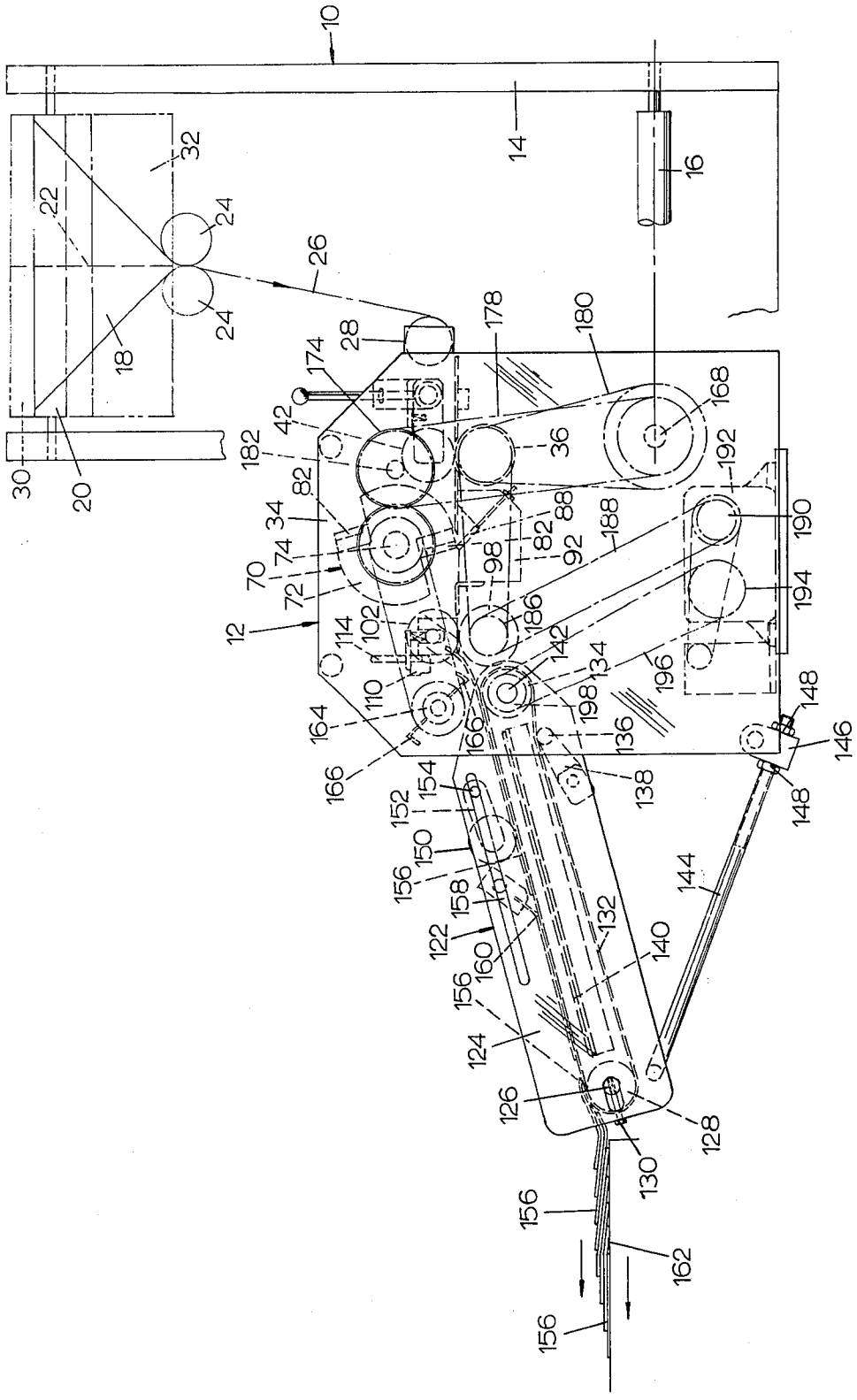

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FIG. 1

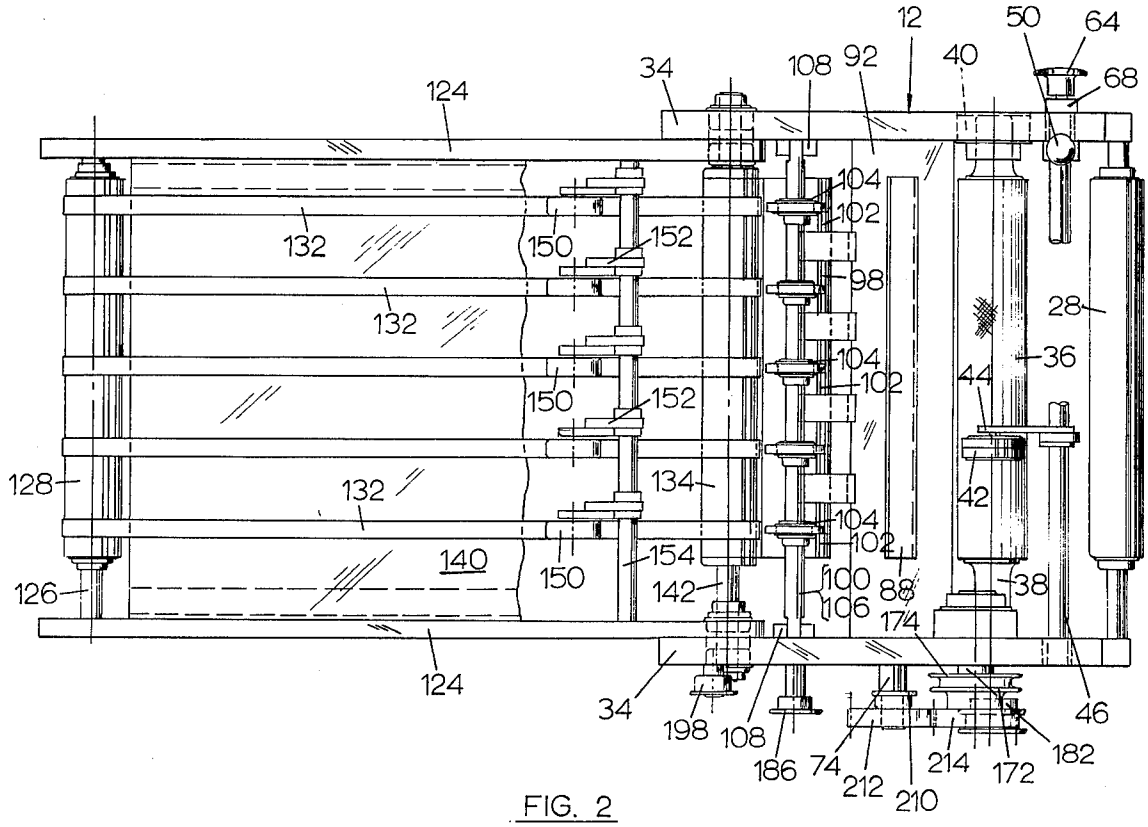

FIG. 2

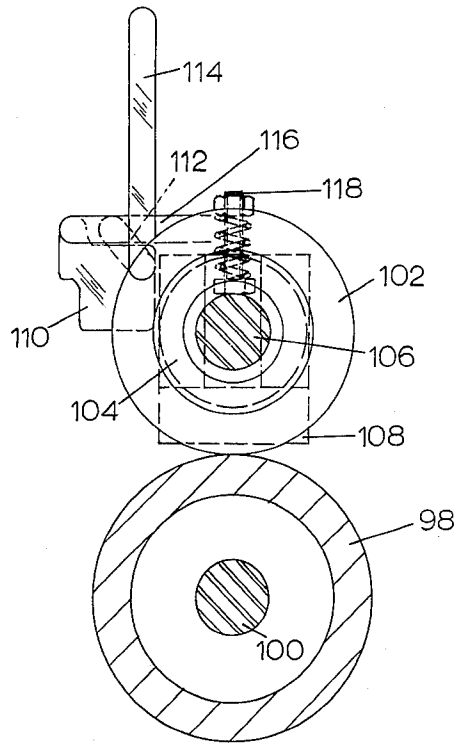

FIG. 4

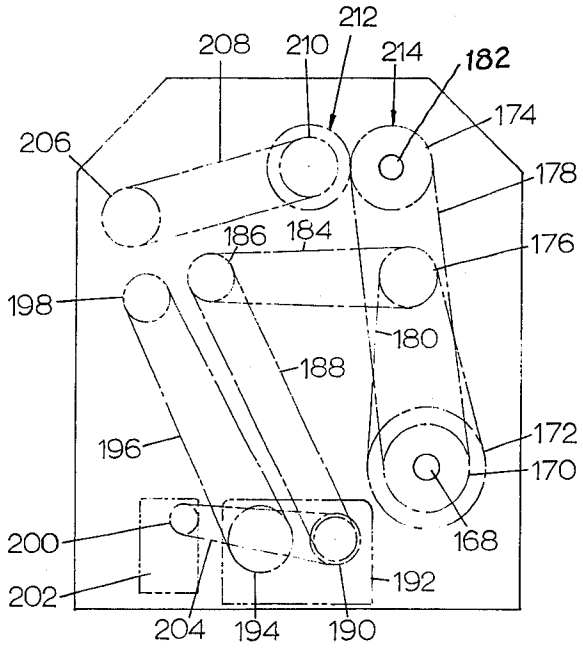

FIG. 3

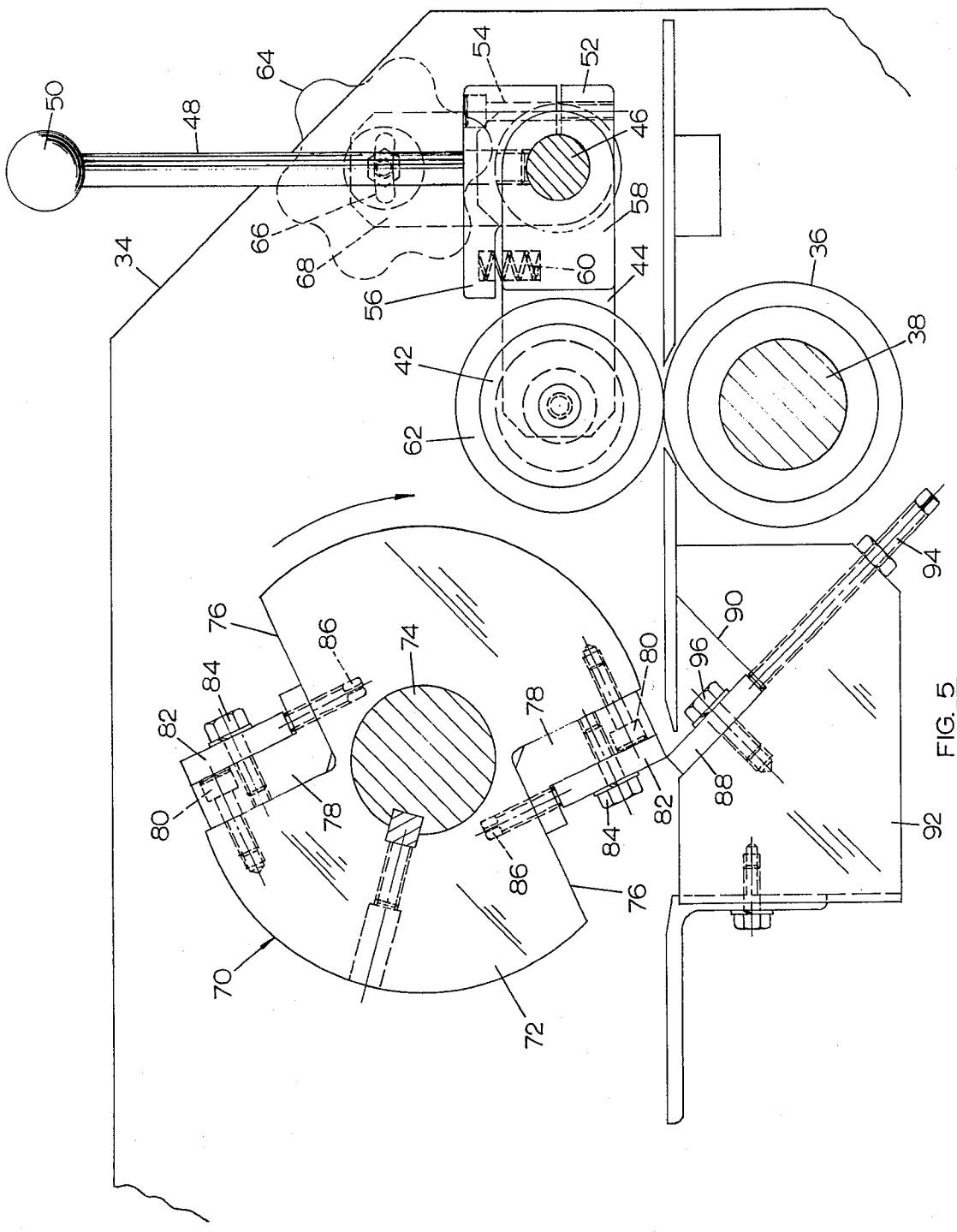
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FIG. 5

AUXILIARY CUT-OFF UNIT FOR WEB PRINTING PRESSES AND METHOD OF FORMING SEVERED PIECES

BACKGROUND OF THE INVENTION

Present rotary web printing presses basically fall into two categories, which are: (1) A "signature" type press which delivers a predetermined folded signature of single or multiple webs into a fixed size product, which usually consists of a cross-folded product of half the "repeat length" of the printing cylinder circumference, which may or may not be folded half again, either parallel to or across said first fold. Such products, known as "signatures" are crudely cut and also contain impaling "pin holes," therefore often necessitating further off-line trimming operations. (2) A roll-to-roll or roll-to-sheet single web press which is limited to delivering printed sheets precisely the length of the repeat length, comprising the cylinder circumference of said press, or rewinding said web into rolls for further off-line operations. These characteristics greatly limit and circumscribe such presses to a very limited type of printed and/or folded product.

The purpose, therefore, of the present invention is to enable printers owning web rotary presses of either type mentioned above to greatly increase the flexibility of the size and type of product they can deliver from said presses, as well as eliminating costly and time-consuming supplementary off-line finishing operations, such as cutting, trimming, gathering and folding, and deliver instead a substantial variety of finished products all resulting from one operation, by utilizing either portions of the folding equipment, such as the "former" which is frequently already on said press, or by the addition of other well-known auxiliary press equipment as special formers, plows, gluing equipment, perforating wheels, side trimmers and the like. Since these rotary web presses represent an investment to the printer from hundreds of thousands to millions of dollars, increasing the versatility of such equipment, as well as eliminating costly offline operations simply by adding this comparatively inexpensive auxiliary rotary cut-off unit, its use comprises a very desirable investment, as well as an economical necessity.

There are auxiliary sheeters on the market at present which can be added in-line to notary presses of type 1 referred to above, but this, as in the type 2 rotary presses mentioned above, permits the printer only the ability to deliver a sheeted product of one fixed size which is the "repeat length" of the printing cylinder, to be delivered, therefore resulting in the need of costly usually slow, off-line operations that add nothing to the value of the finished product and greatly increase the waste and additional expense factors.

One typical form of apparatus of the type referred to above is illustrated in U.S. Pat. No. 2,092,977, in the name of Kaster, issued Sept. 14, 1937. Cutting knives and impaling pins of the type referred to are illustrated in this patent, whereby the detrimental effects described above exist in the product produced by the machine comprising the subject matter of the patent.

Label cutting devices per se which may be operated either individually, or in association with a printing press, also are available. One typical example of such device is illustrated in U.S. Pat. No. 1,837,612, in the name of Gangler, issued Dec. 22, 1931. Such device is of the type adapted to sever individual labels from a web, the labels being of even length in accordance with the spacing of the multiple cutting blades which are of a fixed nature.

Still another example of the prior art used at present is shown in U.S. Pat. No. 2,766,039, in the name of Matthews, issued Oct. 9, 1956, in which a sheeter is shown having means to fold, cut, feed and stack sheet material, products of a single fixed size certain types of grippers being required to effect feed of the severed sheets.

The principal purpose of the present invention is to overcome the deficiency of the fixed nature of signature forming and cutting devices furnished as an integral part of rotary web presses, or of fixed size auxiliary sheeters used at present in direct association with rotary printing presses in order to eliminate waste caused by ragged trimming and pin holes caused by impaling pins and to deliver finished folded or unfolded pieces of one or more thicknesses of various lengths of preprinted material in line with the press, as well as eliminating secondary finishing operations, details of such improved unit and the method of operating the same being set forth hereinafter.

SUMMARY OF THE INVENTION

It is the principal object of the present invention to provide primarily for use with a web type printing press adjacent a forming and folding blade if included in the press, by which the printed web is folded longitudinally along a line between the opposite edges of the web, a variable auxiliary rotary cutoff unit which includes a movable cutting blade having a driving means interconnected to a drive shaft of the printing press so as to be in direct relationship to the speed thereof, the drive means for the cutting blade being adjustable, however, relative to the speed of the web so as to sever said web at precisely longitudinally spaced locations to form severed folded and printed pieces of desired uniform length, the cutting blade severing the web smoothly and evenly transversely across the web to provide finished cut edges at opposite ends of said severed pieces, whereby no subsequent or auxiliary trimming of the pieces is required.

It is another object of the invention to effect the variable drive for the cutting blade by utilizing a rotatable cylinder or roll having at least one cutting blade extending longitudinally thereof so as to be transverse to the line of feed of the web, said rotary blade preferably cooperating with a stationary bed knife over which the folded web moves at the delivery speed of the web as discharged from the printing press, said variable rotary cutoff unit including a main drive shaft which is interconnectable to one of the driven shafts of the printing press for direct operation thereby and adjustable driving means being connected between the said main drive shaft of said unit and the aforementioned rotary blade to effect the desired speed of said blade in relation to the speed of the web fed thereto.

It is a further object of the invention relative to the aforementioned object to provide a plurality of sets of meshing gears each having a different ratio and the gears of each set respectively being connected to the shaft which supports the rotary blade and interconnected to the main drive shaft, said different sets of meshing gears affording a suitable range of adjustability of driven speeds of the rotary blade relative to the feed speed of the web delivered thereto.

It is still another object of the invention to provide primary and auxiliary feed rolls respectively adjacent the delivery and discharge sides of the rotary blade, the auxiliary feed rolls being driven at a faster speed than the primary feed rolls to insure separation of the severed pieces from the oncoming web, whereby said severed pieces may be fed to a discharge conveyor, said conveyor being driven at a speed suitable to receive the severed pieces in shingle-like manner.

Still another object of the invention is to provide a rotatable knock-down member which engages the severed pieces to knock the leading ends thereof down toward said conveyor to insure the formation of the shingle-like arrangement of the severed pieces upon the conveyor for movement to suitable counting, packaging or other similar types of mechanism.

Still further objects of the invention are to provide various types of refinements and improvements in the mounting of the various cutting blades to provide for adjustability, supporting means for the primary and auxiliary feed rolls, and also in the drive means for the various movable elements so as to interrelate the operation thereof in a manner to produce a coordinated result from employment of the various principles of the invention.

Details of the foregoing objects and of the invention, as well as other objects thereof, are set forth in the following specification and illustrated in the accompanying drawings comprising a part thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an end elevation of a delivery end of an exemplary printing press which is illustrated fragmentarily and a variable rotary cutoff unit being illustrated in side elevation somewhat diagramatically, to illustrate a combination comprising part of the present invention and incorporating the principles thereof.

FIG. **2** is a top plan view of the variable rotary cutoff unit illustrated in FIG. **1.**

FIG. **3** is a diagramatic vertical elevation illustrating the drive means for the various elements of the variable rotary cutoff unit shown in FIGS. **1** and **2.**

FIG. **4** is a fragmentary, vertical elevation, partly in section, illustrating details of the auxiliary feed rolls employed in the unit shown in FIGS. **1** and **2.**

FIG. **5** is a side elevation, partly in vertical section, illustrating details of the severing blades of the primary feed rolls by which a web is fed to the blades.

DETAILED DESCRIPTION

Referring to FIG. **1,** an exemplary web type printing press **10** is illustrated only fragmentarily in FIG. **1,** primarily to illustrate the relationship thereof to the variable rotary cutoff unit **12** which is also illustrated in FIG. **1** in diagramatic relationship to the printing press **10.** Only very limited details of the press **10** are illustrated in view of the fact that the press is of a conventional type of said view in FIG. **1** is intended to represent the delivery end of said press. In this view, a portion of the frame **14** is shown for purposes of supporting a driven shaft **16** which is of an exemplary type and may be one of a number of different shafts in the press to represent a relationship of the speed at which the printed web **18,** which is of infinite length, moves over a final guide roll **20** to deliver the web in precise transverse relationship to an exemplary forming blade **22,** which is shown by dotted lines to represent a conventional type of blade beneath the web **18** for purposes of creasing the web longitudinally along a crease line which is precisely spaced from the opposite edges of the web. The web is fed between a pair of nip rolls **24** which are driven at a surface speed equal to that of the web **18,** by means interconnected to the driving mechanism of the press, not shown, so as to feed the precisely, longitudinally folded and creased web **26** around a portion of a guide roll **28** at the receiving end of the cutoff unit **12.**

The illustration of the press **10** in FIG. **1** also includes several exemplary printing rolls or cylinders **30** and **32** which are only illustrated in phantom, it being understood that a plurality of sets of said printing rolls or cylinders may be included in the press, especially if multicolor printing is to be produced.

The cutoff unit **12** is provided with a suitable frame **34** which is shown somewhat diagramatically in FIG. **1.** It will be understood that opposite sides are provided in said frame and suitable bearings are mounted in said sides to support the various rolls, shafts, and other rotatable means to be described in detail hereinafter. Preferably, the frame **34** is mounted immediately adjacent the delivery end of the printing press **10** so as to conserve space. Because of the manner in which the printed web **18** is folded longitudinally to form the folded web **26,** in plan view, the longitudinal axis of the cutoff unit **12** will be substantially at a right angle to the longitudinal axis of the web type press **10.** Therefore, further to conserve space, it is preferred that the cutoff unit **12** be no longer than necessary, in accordance with the principles of the present invention. Therefore, the various elements included therein, which are described in detail hereinafter, are closely located in compact relationship to each other, as will be seen from the following description.

In FIG. **2** the exemplary side frame members **34** are shown in plan view with the various shafts which support the individual elements of the cutoff unit **12** are shown. The shaft for example which supports the guide roll **28** is shown in FIG. **2.** Closely adjacent the guide roll **28** is a primary feed roll **36** which is supported on a shaft **38,** the opposite ends of which are mounted in suitable bearings **40,** one of which is illustrated in FIG. **2.**

In order to render the primary feed roll **36** effective, a plurality of relatively narrow pressure rolls **42** respectively are rotatably mounted upon a plurality of spaced supporting arms **44;** only one roll **42** is shown in FIG. **2,** for simplicity. The ends of the arms **44** which are opposite the ends that support the pressure rolls **42** are mounted upon a fragmentarily illustrated shaft **46** for limited rotation thereon. The opposite ends of the shaft **46** are mounted in suitable bearings formed in the side frames **34.** A vertically extending rod **48,** having a manually engageable knob **50** on the upper end thereof, is fixed radially to one end of shaft **46.**

Shaft **46** also supports a series of similar split blocks **52** which are best shown in FIG. **5,** said blocks including a clamping bolt **54** by which the split blocks respectively are clamped fixedly on shaft **46** for limited rotation therewith relative to the frame **34.** Each block **52** is positioned adjacent one of the supporting arms **44** and an extension **56** on each of the blocks partially overlies lug **58** connected to one side of each arm **44.** Suitable bores respectively formed in the extension **56** and lug **58** of each set of the supporting means for the

pressure rolls **42** receives a compression spring **60** for purposes of exerting limited pressure of suitable degree upon each of the arms **44** in order to urge the pressure rolls **42** against the folded web **26** as it moves between primary feed roll **36** and the pressure rolls **42,** as driven by the feed roll **36** at a uniform surface speed substantially equal to or slightly greater than the web speed of the press. Preferably, the peripheries of the pressure rolls **42** have a compressible rubber band **62,** for example, mounted thereon for engagement with the upper surface of the folded web **26.**

Pressure to be exerted by the pressure rolls **42** upon the web is set at the beginning of any operation of the rotary cutoff unit by moving the adjusting rod **48** arcuately in the desired direction to carry all of the blocks **52** in the same direction. When the adjusted position thereof is reached, a manually rotatable knob **64** which has a threaded shaft fixed thereto that extends through an arcuate slot **66** formed in the upper end of an arm **68** fixed to one of the side frames **34** is rotated to clamp the adjusting rod **48** relative to the side frame **34.** Correspondingly, all of the blocks **52** likewise are clamped in said adjusted position. However, because of the yieldability of springs **60,** the individual arms **44** which support the pressure rolls **42** may yield a limited extent if variations in the movement of the folded web may require the same.

The primary feed roll **36** is driven by means described hereinafter, the surface speed thereof preferably being slightly greater than the speed of the web which is fed to the cutoff unit **12.** The primary feed roll **36** feeds the folded and creased web **26** at uniform speed to the movably mounted cutter assembly **70,** details of which are best illustrated in FIG. **5.** As shown in said figure, the cutter assembly **70** preferably comprises a cylinder **72** supported by notatable shaft **74,** the opposite ends of which are appropriately mounted within bearings respectively provided in the side frame members **34.** In the exemplary illustration shown in FIG. **5,** the cylinder **72** is provided with a pair of diametrically opposed V-shaped channels or seats **76** which extend longitudinally of the cylinder **72** for purposes of receiving, respectively, similar cutter supporting base plates **78** which respectively are clamped against one face of each seat **76** by a plurality of appropriate clamping bolts **80.** Adjustably clamped to the outer face of each of the base plates **78** is an axially extending severing and cutting blade **82.** In the preferred construction, the blades **82** are similar and may be slightly spiraled, whereby, for example, one end may have a lead of the order of approximately one-half inch over the other end. Such an arrangement reduces the power requirements to drive the cutting blades **82.** Also, the blades **82** preferably have slots of short length through which clamping bolts **84** extend and are threaded into the base plate **78.** Suitably threaded into opposite ends of the base plate **78,** which preferably project beyond the opposite ends of the cylinder **72,** are blade adjusting screws **86,** one end of each of which respectively engage opposite ends of the blades **82** to position the same in a radial direction with respect to the movable folded web **26** to sever predetermined lengths thereof by a shearing action resulting from coaxion of the rotary blades **82** with respect to a stationary bed knife or blade **88.**

The stationary blade **88** is effectively supported by one wall of a transversely extending recessed seat **90** formed within a transversely extending base member **92** which extends between and is secured appropriately to the side frames **34.** A pair of relatively long adjusting screws **94** are threaded into the base member **92** adjacent opposite ends thereof respectively for engagement with opposite ends of the stationary blade **88** so as to adjust the cutting edge thereof with respect to the cutting edges of the rotary blades **82.** When suitable adjustable positioning of the stationary blade **88** has been achieved, clamping bolts **96,** which extend into and are threaded into the base member **92** securely clamp the stationary blade **88** in said adjusted position. In the event the rotary blades **82** are slightly spiraled, for example, as described above, the stationary blade **88** is similarly spiraled but the lead of one end thereof over the other is at the opposite side of the cutoff unit **12** from the lead of the rotary blades **82,** whereby an accurate and precise even and clean shearing cut is imparted to the moving web, said cut also being precisely perpendicular to the longitudinal axis of the moving web.

After the severing of successive precisely dimensioned pieces has been made from the moving web **26,** the severed pieces are engaged by auxiliary feed rolls comprising a series of longitudinally spaced narrow lower feed rolls **98** which are supported upon a shaft **100** extending transversely between the opposite side frames **34.** Cooperating with each of the lower feed rolls **98** is an upper pressure roll **102.** The rolls **102** are relatively narrow and respectively comprise rubber circular rims mounted upon the outer race of a ball bearing unit **104,** the inner race of each of which is mounted commonly upon a transverse shaft **106.** The opposite ends of shaft **106** respectively are mounted in U-shaped yokes **108** which open upwardly. Said yokes respectively are attached to the inner surfaces of the upper side frames **34** as shown in FIG. **2.** The opposite ends of the shaft **106** are yieldably maintained within the throats of the U-shaped members **108** by lever-operating clamping units **110** which are similar to clamping units used in various types of wooden cabinet work and the like. A toggle arrangement **112** is operated by the actuating lever **114** which, when moved in one direction, depresses the clamping arm **116** downwardly relative to shaft **106.** The outer end of the arm **116** supports a bolt **118,** for example, around which a compression spring **120** is mounted and operates to normally urge the lower end of the bolt **118** downwardly against the shaft **106.** However, if variations in the pieces moving beneath the pressure rolls **102** occur, the shaft **106** and the pressure rolls **102** thereon are capable of yielding upwardly until normal operation is restored.

A discharge unit **122** extends outwardly from the auxiliary feed roll means comprising lower feed roll **98** and the plurality of upper pressure rolls **102.** Said unit comprises similar, opposite and parallel side plates **124.** Extending between said side plates adjacent the outer end thereof is a shaft **126** upon which a belt-carrying roll **128** is mounted. The opposite ends of the shaft **126** preferably are supported in slots of limited length in the side plates **124,** as shown in FIG. **1,** for purposes of providing belt-tightening screws **130** to effect tightening of the plurality of belts **132,** which are transversely spaced from each other, as shown in FIG. **2,** the opposite ends of the belts extending around another belt-tightening roll **134.** Also, as seen in FIG. **1,** additional belt-

tightening means in the form of a roll **136** is supported at opposite ends by suitable arms **138** which are movable pivotally through limited arcs relative to the side plates **124** and appropriate means maintain the arms in adjusted position after the belts **132** have been suitably tightened.

An appropriate plate **140** extends between the upper and lower courses of the belts **132,** said plate having downwardly extending flanges at opposite edges which are suitably connected to the inner surfaces of the side plates **124.** This arrangement stabilizes the discharge unit **122.** The innermost ends of the side plates also have bearings through which the shaft **142** extends that supports the belt-carrying roll **134.** The outer end of the discharge unit **122** is adjustably supported by means of a pair of rods **144** which are pivotally connected at the outer ends thereof to the lower, outer corner portions of the side plates **124** and the opposite ends thereof are adjustably mounted with respect to clevises **146** which are pivotally supported between opposite side frame members **34.** Lock nuts **148** are threaded on the inner ends of the rods **144** and respectively engage opposite sides of the clevises **146** to maintain desired adjustment of the rods **144** in order to dispose the discharge unit **122** at a desired downwardly extending angle with respect to the discharge end of the cutoff unit **12.**

Due to the auxiliary feed roll means operating at a faster speed than the surface speed of the movable cutter assembly **70,** by means to be described hereinafter, the pieces which are cut by the movable cutter assembly **70,** in cooperation with the stationary bed blade **88** move onto conveyor belts **132** in separated manner from each other. Pressure rolls **150** respectively are supported on arms **152** which are connected at one end to support shaft **154** which extends between the opposite side plates **124** as clearly shown in FIGS. **1** and **2.** The rolls **150** are substantially as wide as the belts **132** and are directly aligned with the upper course of each belt. The rolls **150** serve to maintain the separated cut pieces **156** of the folded web **26** against the upper courses of the belts **132.** For further purposes of insuring carrying and advancing of the cut pieces of the belts **132,** additional drag means are provided in the form of a pivoted block **158** which extends transversely between the opposite side plates **124,** see FIG. **1,** the trailing edge thereof supporting a flexible sheet of partially frictional material such as a strip of sheet rubber **160.** The outer ends of the upper courses of the belts **132** discharge the cut pieces **156** onto a suitable moving conveyor **162** which is indicated somewhat diagramatically in FIG. **1.** Said conveyor moves at a substantially slower speed than the belts **132,** whereby the cut pieces **156** are disposed in shingle fashion thereon for transportation to supplemental operation such as counting, packaging and the like. When the cut pieces have reached this station, however, they are completed and require no further finishing operations of any kind such as auxiliary trimming, folding, or otherwise. Therein lies one of the principal advantages of the present invention, namely, that when the web **26** is severed by the operation of the rotary blades **82** in coaxion with the stationary bed blade **88,** such severing is clean, precise and accurately perpendicular to the line of movement of the web through the cutoff unit **12.** However, to insure that the cut pieces will be suitably directed onto the upper courses of the belts **132,** the cutoff unit **12** is provided with a knock-down rotary member **164** which is carried by a suitable shaft extending between the opposite side frames **34** of the cutoff unit **12.** The rotary member has a pair of similar L-shaped fingers **166** extending in opposite directions therefrom. The member **164** is rotated in direct rotary speed with that of the movable cutter assembly **70.** Especially in view of the fact that a pair of fingers **166** are provided on the rotary member **164** and a pair of rotary blades **82** are mounted on the movable cutter assembly **70,** it will be seen that each severed piece **156** which is cut by the severing mechanism will be directly engaged at the leading end thereof by one of the fingers **166.** It will be understood that a plurality of the fingers **166** are provided on the cylindrical rotary member **164** and extend in spaced relationship across the length thereof. For purposes to avoid complexity in the illustration of FIG. **2,** the rotary member **164** and the fingers **166** thereon are not illustrated in said figure but instead are shown in FIG. **1** in side elevation. For similar purposes, the movable cutter assembly **70** also has been omitted from the illustration in FIG. **2** but it can be visualized that the same is mounted directly above the stationary bed blade **88** which is illustrated in FIG. **2.**

THE DRIVE SYSTEM

One of the most important features of the present invention comprises the means by which the various elements of the cutoff unit **12** are operated in direct relationship to the speed of the press with which the knock-down unit is directly associated. The drive mechanism is shown in limited detail in FIG. **1,** and diagramatically, the same is shown also in FIG. **3.** Referring to FIG. **1,** the exemplary drive shaft **16** of the printing press is illustrated fragmentarily, it being understood that the main drive shaft **168** of the cutoff unit **12** is suitably and directly connected to the driven shaft **16** of the printing press by any appropriate means conventional in the printing industry. As will be seen from FIG. **2,** the drive mechanism is located substantially entirely at one side of the cutoff unit **12,** exteriorally of the side frame member **34** thereof. Sprocket gears **170** and **172** are directly connected to the shaft **168.** For purposes of connecting the sprocket gears **170** and **172,** which are driving sprocket gears, to the driven sprocket gears **174** and **176,** roller-type bicycle chains **178** and **180** of suitable size and strength extend respectively around sprocket gears **170** and **174** and sprocket gears **172** and **176.** Preferably, the other sprocket gears referred to hereinafter likewise are connected by suitable roller-type bicycle chains identified hereinafter by appropriate reference numerals. Sprocket gear **176** is directly connected to the shaft of primary feed roll **36.** Sprocket gear **174** is directly connected to an auxiliary drive shaft **182,** see FIG. **1,** which is parallel to and substantially in the same horizontal plane as the rotary blade shaft **74,** as also can be seen from FIG. **1.** The auxiliary drive shaft **182** has a very important function, as explained hereinafter.

Sprocket gear **176** also is connected by a sprocket chain **184** to sprocket gear **186** which is fixed to the drive shaft for the lower feed roll **98** of the auxiliary feed roll means. From FIG. **3** in particular, it will be seen that the sprocket gear **186** is smaller than gear **176,** whereby the rotary speed of the auxiliary feed roll **98** is greater than that of primary feed roll **36,** as explained above. Sprocket gear **186** is connected by

sprocket chain **188** to a driven sprocket gear **190** by which the gear transmission unit **192** is operated. The unit **192** is a variable speed drive unit and may be adjusted preferably between zero and maximum speeds. The output sprocket gear **194** of the gear unit **192** will be seen from FIGS. **1** and **3** to be substantially larger than driven gear **190** of said unit and, under normal courses of operation, the speed of the gear **194** will be substantially less than that of gear **190.** Sprocket gear **194,** by means of a sprocket chain **196,** drives sprocket gear **198** which is fixed to shaft **142** by which roller **134** is carried for purposes of driving the belts **132** of discharge conveyor unit **122.**

Gear **190** also drives sprocket gear **200** on an oil pump unit **202** by means of sprocket chain **204.** The pump **202,** through suitable conduits, furnishes oil for lubrication to all of the bearings of the cutoff unit **12** due to the fact that the same, in many instances, run at relatively high speeds.

Referring to FIGS. **1–3,** it also will be seen that sprocket gear **206,** by means of sprocket chain **208,** is connected to sprocket gear **210.** Sprocket gear **206** is connected directly to the shaft upon which the knockdown rotary member **164** is driven and sprocket gear **210** is connected directly to the shaft **74** of the movable cutter assembly **70.** As specifically illustrated in FIG. **3,** the sprocket gears **206** and **210** are of the same size. From FIG. **3** especially, it will be seen that no drive is connected between the sprocket gears **174** and **210** and the other extensively interconnected sets of sprocket gears and the sprocket chains extending therebetween. This situation also constitutes another very important part of the present invention, for the following reasons:

In view of there being no connection, for example, between sprocket gears **174** and **210,** as illustrated in FIG. **3,** there is no connection shown between shaft **74** of the movable cutter assembly **70** and shaft **182** which is an auxiliary drive shaft. However, referring to FIG. **2,** it will be seen that the shaft **74** and **182** are interconnected by a pair of meshing spur gears **212** and **214.** Said spur gears have a predetermined ratio therebetween. When keyed and otherwise connected to the shaft **74** and **182,** they are capable of transmitting driving power from the main drive shaft **168** to the shaft **74** of the cylinder **72** upon which the rotary cutting blades **82** are fixedly supported for rotation therewith to coact with the stationary bed blade **88.** By way of example, assuming that the printing cylinder is 23½ inches in diameter, which, incidentally, is a very conventional size of printing cylinder on rotary web presses of the type with which the cutoff unit **12,** comprising the present invention, is admirably suited to cooperate. Under such circumstances, the particular pair of meshing gears **212** and **214** are designed to drive the rotary cutting blades **82** at a speed relative to the speed of the web so that each blade will sever a cut piece of folded web **156** which is 11¾ inches long when both blades **82** are active.

To produce folded and cut webs of shorted lengths, and thereby render the printing press capable of producing folded and printed pieces and different, small lengths, it is the purpose of the present invention to provide a plurality of sets of gears respectively attachable to the shafts **74** and **182** and each set having a different ratio, which ratio preferably is indicated on the sets of gears by suitable labels or indicia. For example, the set of gears selected as above is of such ratio that the shafts **74** and **182** are driven to cause the rotary blades **82** to cut printed, folded lengths of the web half the maximum length, of 11¾ inches, the same being half the circumference of the printing cylinder. By retracting one of the blades **82** to inactive position, pieces having a maximum length of 23½ inches are produced. Still other meshing sets of gears having further different ratios which can be mounted upon shafts **74** and **182** will be selected, for example, so as to provide various speeds of the rotary cutting blades **82** relative to the speed of the web so as to produce cut pieces of the folded, printed web which are ¼, ½, ⅓, ⅔ or any other desired fraction of the circumference of the printing cylinder. By such means, it therefore, will be seen that the drive for the rotary cutting blades **82** may be adjusted to operate at a relatively wide range of speeds relative to the speed of the web being fed to the cutoff unit **12.** To provide examples of a limited number of sets of gears according to gear teeth on each to produce commonly used lengths of pieces **156,** the following table is set forth:

	CHANGE GEARS		
SHEET LENGTH	BLADES USED	GEAR 212	EAR 214
Full	1	45	45
Half	2	45	45
One-third	2	36	54
Two-thirds	1	36	54
Quarter	2	30	60

While it is conceivable that certain types of variable speed transmission units might be connected between the shafts **74** and **182,** this would not be practical because the length of the printed piece has to be regulated relative to the circumference of the printing cylinder of the press, as well as the diameter of cutter cylinder **72.** Therefore, from a practical standpoint, producing cut pieces which are certain fractions and preferably major fractions of the circumference of the printing and cutter cylinders is, in reality, the only necessary and practical range of lengths for the folded and printed pieces to be produced by the cutoff unit **12** comprising the principal feature of the present invention. However, gear ratios of a very extensive range may be used to produce finished pieces of almost any desired length.

For convenience, the various sets of gears which are preferably furnished with each cutoff unit **12** may be contained in an appropriate cabinet conveniently located for readily being selected and substituted for a pair of gears already in use on the cutoff unit. The gears preferably are provided with suitable key ways complimentary to keys on the shafts **74** and **182.** By the use of appropriate locking nuts or other securing means, the gears are fastened to the shafts and operation of the cutoff unit may commence.

From the foregoing, it will be seen that the present invention provides a relatively simple and direct means for cleanly severing precise lengths of folded, printed pieces of literature or otherwise from a continuous folded web thereof by directly associating the cutoff unit with the forming blade at the discharge end of a web press so that the precisely folded and creased web may be formed and the cut piece requiring no further trimming or other finishing operations. This permits by-

passing all of the conventional perforating, cutting and folding mechanism normally associated with a web press, coupled with subsequent additional trimming means of one kind or another which must be employed, for example, to sever ragged, perforated edges from the folded pieces and otherwise remove excess length or width therefrom as usually is necessary in regard to printed pieces formed upon conventional web presses having conventional sheeter units associated therewith. Hence, avoidance of waste in paper and other sheet material capable of being handled by the present invention represents substantial savings to be accomplish by using the mechanism of the invention, as well as additional savings resulting from the minimum amount of handling of the cut pieces, all of which handling is accomplished automatically after the printing press and cutoff unit of the present invention associated therewith are set in motion.

While the invention has been described and illustrated in its several preferred embodiments, it should be understood that the invention is not to be limited to the precise details herein illustrated and described as the same may be carried out in other ways falling within the scope of the invention as illustrated and described.

I claim:

1. An auxiliary in-line rotary cutoff unit adapted to be connected to and driven directly by a web printing press to provide the same with capabilities of producing from a longitudinally folded or unfolded continuous flexible web of one or more thicknesses of precise width printed pieces each having precisely uniform lengths cleanly and evenly severed on all cut edges and requiring no additional trimming, said cut-off unit comprising in combination, a frame, a pair of cooperating feed rolls supported by said frame and adapted to receive and feed a longitudinally folded or unfolded printed web directly from a web printing press, means operable to drive said feed rolls at a fixed surface speed substantially equal to the speed of the web discharged from said press, a rotary cutting member comprising a cylinder having at least one shearing blade extending longitudinally thereon and radially adjustable relative to the axis of said cylinder and said blade being engageable with said web as fed by said feed rolls, a drive shaft for said cylinder of said rotary cutting member supported by said frame, a bed knife supported stationarily by said frame adjacent said cylinder and adjustable towards and from said cylinder for precise shearing engagement with said shearing blade of said cylinder, and adjustable drive means interconnected to said drive shaft for said rotary cutting member adapted to be connected directly to drive means on said printing press, said adjustable drive means being adapted to vary the rotational speed of said rotary cutting member relative to the speed of said web fed thereto to cause said blade of said rotary cutting member to engage said stationary bed knife to sever said web transversely into precise desired uniform lengths smoothly and evenly at opposite ends of the pieces thus severed which comprise finally trimmed pieces having precise finished lengths and widths.

2. The cut-off unit according to claim **1** in which said adjustable drive means further includes a main drive shaft rotatably supported by said frame and connectable directly to said drive means on a printing press, and a pair of meshing gears of predetermined ratio respectively connected one to said drive shaft for said rotary cutting member and the other interconnected to said main drive shaft, said pair of gears being exchangeable for pairs of other ratios to provide a different predetermined speed for said rotary cutting member.

3. The cut-off unit according to claim **2** further including an auxiliary drive shaft supported by said frame adjacent said drive shaft for said rotary cutting member, and drive means connecting said auxiliary drive shaft to said main drive shaft, and interchangeable gears respectively being detachably connected to said auxiliary drive shaft and said drive shaft for said blade.

4. The cut-off unit according to claim **1** further including auxiliary feed rolls supported by said frame adjacent the discharge side of said rotary cutting member, and drive means for said auxiliary feed rolls interconnected to said main drive shaft and operable to drive said auxiliary feed rolls at a speed greater than the speed of said web being severed to separate the cut pieces from each other.

5. The cut-off unit according to claim **4** further including rotary knockdown means supported by said frame adjacent the exit side of said auxiliary feed rolls and interconnected to said drive shaft for said rotary cutting member to drive said rotary means relative thereto, and said cut-off unit further including a discharge conveyor positioned to receive the severed pieces from said auxiliary feed rolls and said rotary knockdown means engaging the leading edges of said severed pieces and knocking said leading edges of said pieces downwardly onto said conveyor to arrange the pieces in overlapping shingle manner thereon.

6. The cut-off unit according to claim **1** further including means to remove cut pieces from said rotary cutting member comprising auxiliary feed rolls and means to drive the same at a surface speed in excess of the speed at which said web is fed to said rotary cutting member and thereby separate the severed pieces longitudinally to facilitate subsequent handling of said severed pieces.

7. The cut-off unit according to claim **6** further including a receiving conveyor positioned to receive said severed pieces from said auxiliary feed rolls, and further including rotatable means operable to engage successively said severed pieces above said receiving conveyor and knock the same downwardly upon said conveyor to form an overlapping shingle arrangement of said pieces upon said conveyor.

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