Nov. 26, 1957 A. R. STOBB ET AL 2,814,484

VARIABLE SIZE FOLDING MACHINES

Filed Oct. 26, 1953 6 Sheets-Sheet 1

Fig. 1.

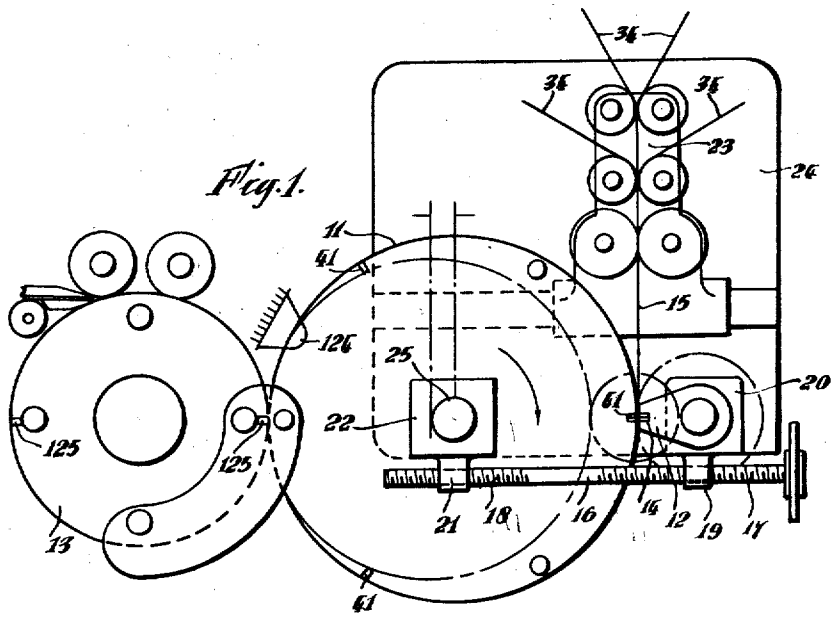
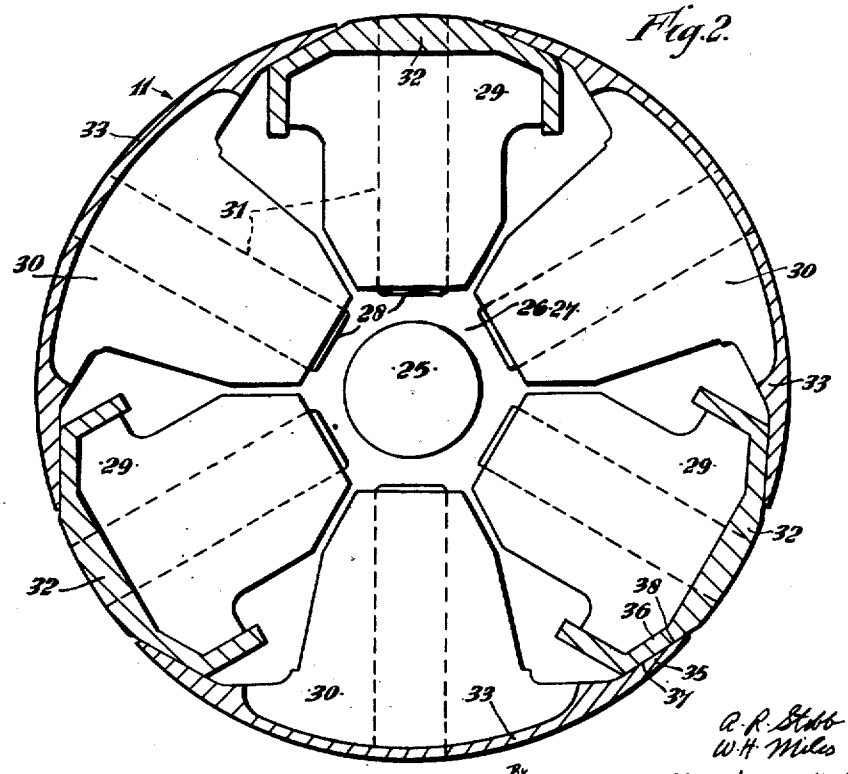


Fig. 2.



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VARIABLE SIZE FOLDING MACHINES

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Fig. 3.

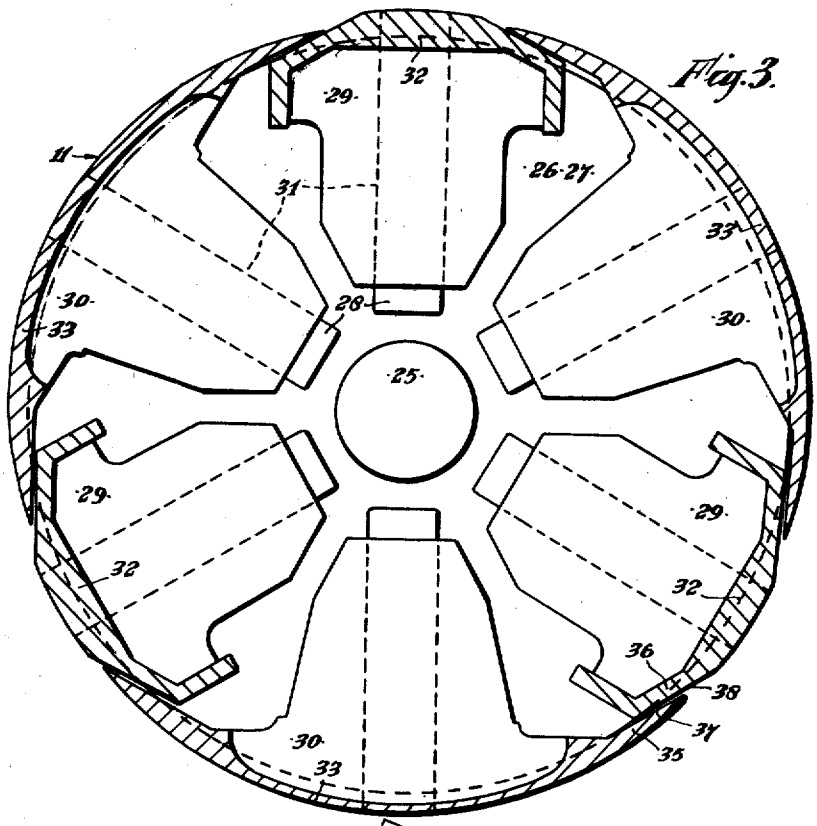
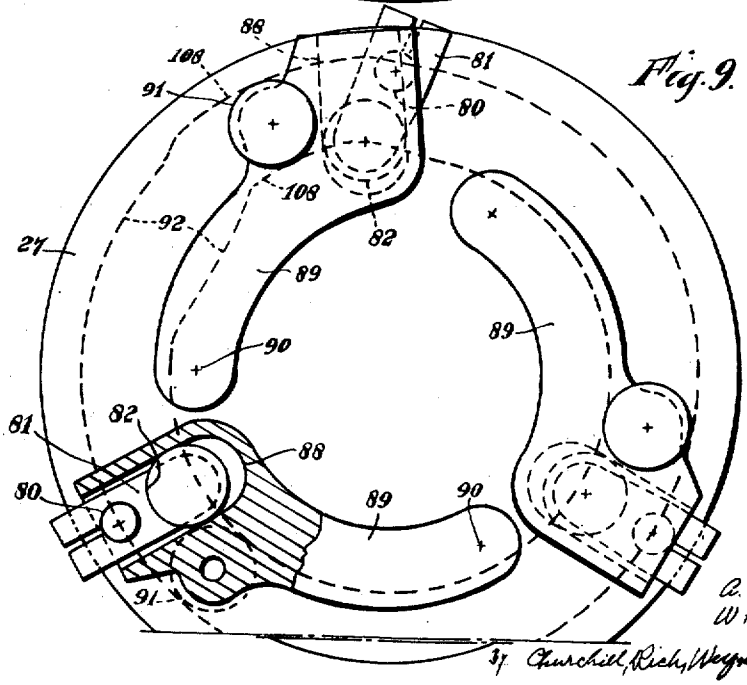


Fig. 9.



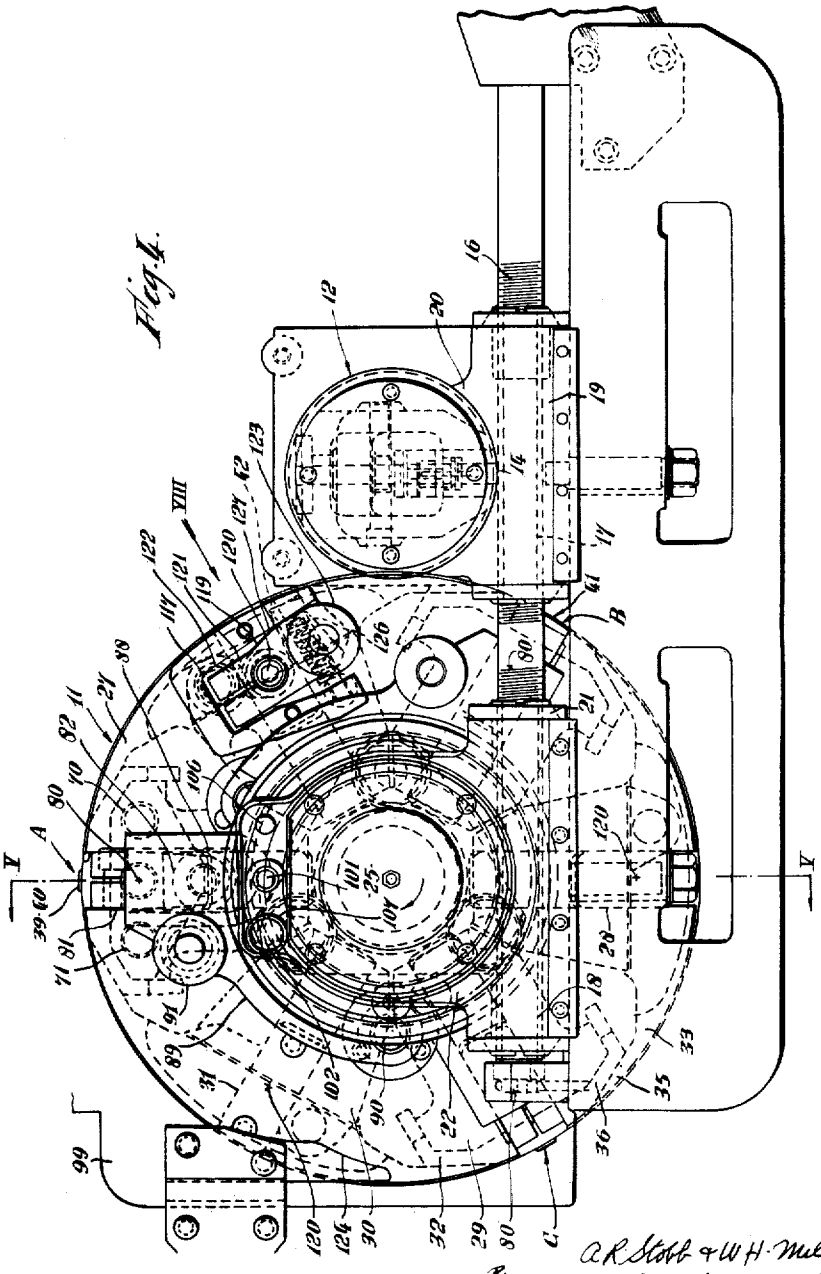
A. R. Stobb
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VARIABLE SIZE FOLDING MACHINES

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Fig. 4.



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Nov. 26, 1957 A. R. STOBB ET AL 2,814,484

VARIABLE SIZE FOLDING MACHINES

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Fig. 6.

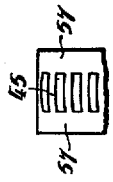
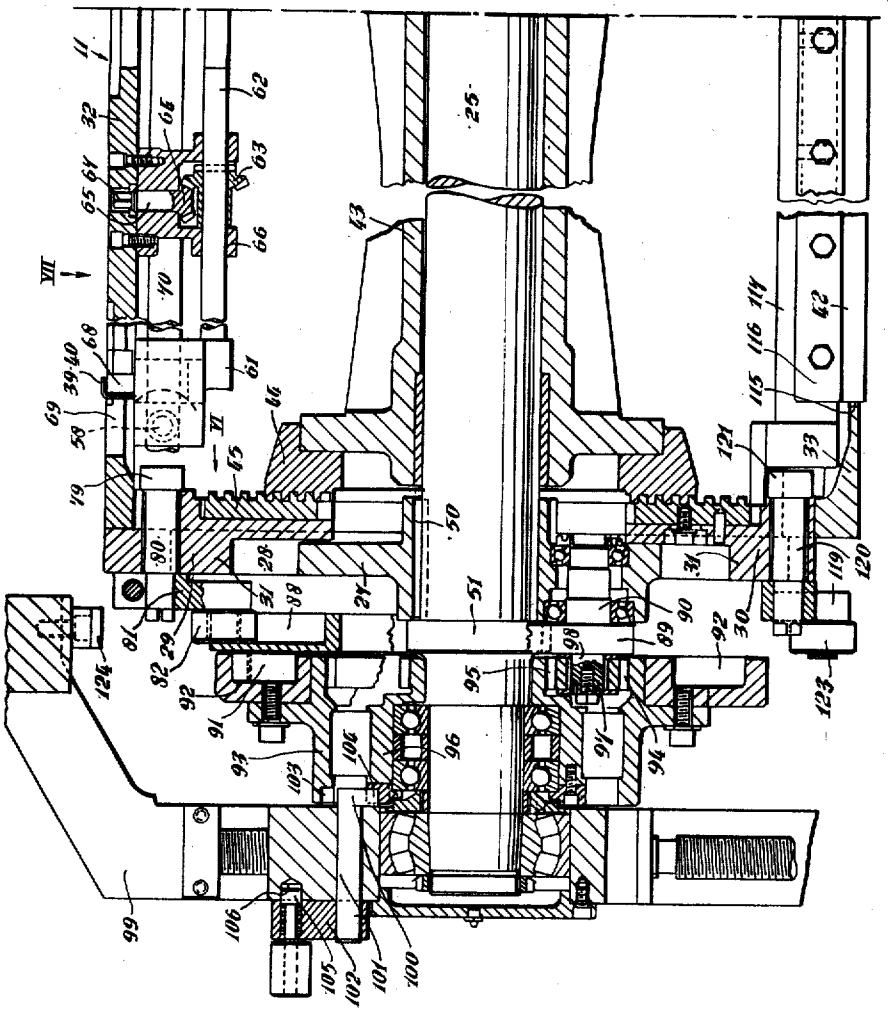


Fig. 5.



A. R. Stobb & W. H. Miles
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VARIABLE SIZE FOLDING MACHINES

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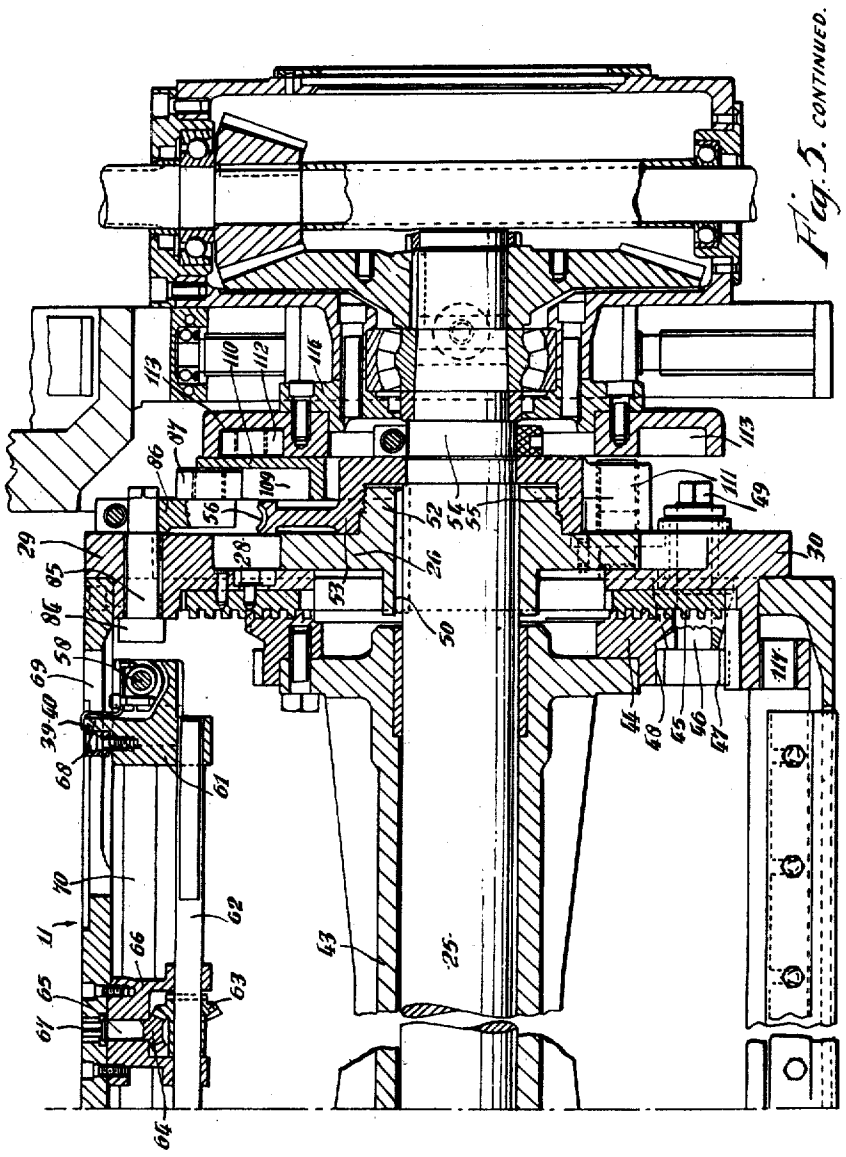


Fig. 5. CONTINUED.

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VARIABLE SIZE FOLDING MACHINES

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Fig. 7.

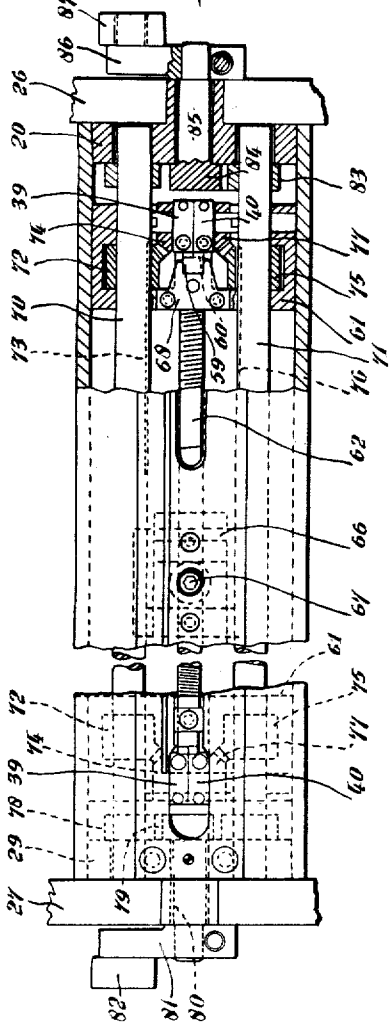
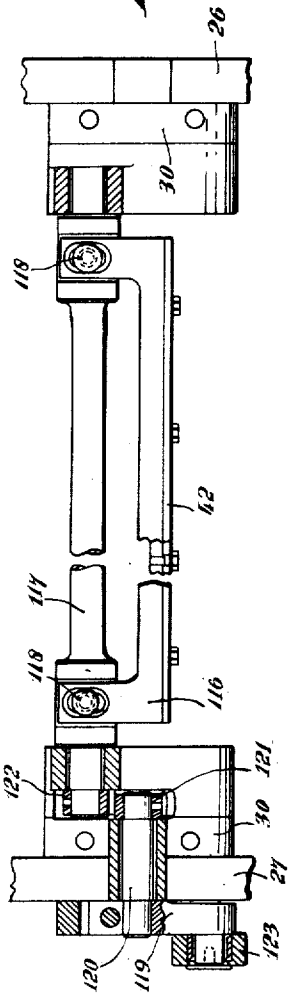


Fig. 8.



A. R. Stobb + W. H. Miles
By Churchill, Rich, Weymouth & Engel
Attys

United States Patent Office 2,814,484 Patented Nov. 26, 1957

2,814,484

VARIABLE SIZE FOLDING MACHINES

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Application October 26, 1953, Serial No. 388,212

8 Claims. (Cl. 270—43)

This invention relates to variable size folding machines, and more particularly to the cylindrical members employed in paper converting machines for the folding or otherwise handling of predetermined lengths of paper web.

In the manufacture of products from a continuous paper web it often occurs that it is necessary for the web to be delivered from one part of the machine at a different speed to that at which it has to be presented to another part of the machine. This condition applies in continuous web fed rotary machines for printing and folding book signatures of multi sizes. Usually, the folding cylinder is of set diameter for all sizes of book signatures, and is of sufficient diameter to accommodate the longest pull or length of web which will be used. The pull size or length of web varies according to the product to be produced, and in consequence some means must be introduced before the folding mechanism to effect synchronisation of the two running speeds, that is, of the web and of the folding mechanism. It has been necessary therefore to provide suitable means between the printing unit and the folding unit to ensure that the severed portions of the web are presented to the folding cylinder at the same speed as the peripheral speed of the folding cylinder no matter at which speed the web is delivered from the printing unit.

Web speed compensating means have been provided, for the purpose described, by which the web is severed into separate lengths for the production of book signatures, after delivery from the printing unit, and each severed web length is then accelerated so that its speed agrees with the speed at which it has to be presented to the folding cylinder so that when the web length is claimed by the folding cylinder the speeds synchronise. These known web speed compensating means apply a travelling effort to the severed web length in such a manner that the web length is pushed to the folding cylinder, the leading edge of the web length not being under positive control. The required relation between the printing and folding units can be effected by substituting in the folder a new primary cylinder of appropriate diameter, but this requires much effort and time to achieve, and it also requires a large range of cylinders of varying diameters to be provided.

The object of the present invention is to provide an improved roll, hereinafter referred to as a primary cylinder for a variable size folding paper machine, of which the circumferential speed is maintained, for all ranges of products, synchronous with the speed of the web as delivered from the printing machine, without the use of compensating means which operate during the working of the machine.

A primary cylinder for a variable size paper folding machine according to this invention is characterized in that said cylinder has a periphery provided by segmental elements, said segmental elements being adjustable radially of the cylinder axis whereby the diameter of said cylinder may be varied. When a larger diameter printing roll is used, the cylinder diameter is increased proportionately. Thus the surface speeds of the roll and the cylinder remain the same and no web speed compensating means are required between the printing and folding units.

The variable diameter cylinder may comprise two series of segmental elements, each series comprising at least two segmental elements, the elements of the first series thereof alternating circumferentially with the elements of the second series, the elements of the second series thereof each having their edges in the circumferential direction overlapping the adjacent edges of the elements of the first series, and all of the elements of both series being adjustable radially of the cylinder axis. Clamping devices may be provided for locking the elements in positions to which they have been adjusted radially. The elements of the first series thereof may be permanently mounted in the cylinder, whilst the elements of the second series thereof may be removably mounted in the cylinder whereby second series elements of various radii and arcuate lengths may be mounted in the cylinder.

One form of variable diameter primary cylinder according to this invention, for a variable size folding machine, is illustrated in the accompanying drawings, wherein:

Fig. 1 is a diagrammatic view showing the relation between the primary cylinder, a secondary folding cylinder and a rotary web severing device.

Figs. 2 and 3 are end elevations of the primary cylinder, with parts in section, and showing only the segmental elements and supporting elements immediately associated therewith, Fig. 2 showing the cylinder in its position of minimum diameter, whilst Fig. 3 shows the cylinder in an enlarged diameter position;

Fig. 4 is an end view of the primary cylinder and the rotary web severing device.

Figs. 5 and 5 continued are, together, a longitudinal section of the primary cylinder, on line V—V of Fig. 4;

Fig. 6 is a fragmentary elevation of a detail, looking in the direction of arrow VI in Fig. 5.

Fig. 7 is an elevation of part of the primary cylinder, with parts in section, looking in the direction of arrow VII in Fig. 5;

Fig. 8 is an elevation of part of the primary cylinder, with parts in section, looking in the direction of arrow VIII in Fig. 4, and

Fig. 9 is an end view of the primary cylinder, showing certain elements only, all other elements being eliminated for clearness of illustration.

The primary cylinder **11** is associated with a rotary web severing device **12**, Fig. 1, and with a secondary folding cylinder **13**. The secondary cylinder **13** is of fixed diameter and is mounted with its axis in a fixed position in relation to the remainder of the folding machine which is not illustrated. The primary cylinder **11** is of variable diameter and is movable towards or away from the axis of the cylinder **13**, to accommodate variations in the diameter of the cylinder **11**, so that the adjacent portions of the peripheries of the two cylinders always are disposed in correct relation to each other. The rotary web severing cylinder **12** has a blade **14** and is adjustable so that the radial distance of the cutting edge of the blade from the axis of the device is variable so as always to retain said radius at a fixed ratio to the radius of the primary cylinder **11**; in the example illustrated this ratio is 1 to 3. The web severing device is movable away from or towards the axis of the primary cylinder **11**, to accommodate variations in the diameter of the cylinder **11** and radius of the blade **14**, so that they always are so disposed in correct relation to each other for the severing blade **14** to co-operate with corresponding means on the cylinder **11** to sever the web **15**.

The said movement of the cylinder **11** and severing device **12** may be effected by a screw threaded spindle **16** which is provided with two separate screw threads **17** and **18** of different pitches. The thread **17** engages a nut **19** on the bearing block **20** of the severing device **12**, whilst the thread **18** engages a nut **21** on the bearing block **22** of the cylinder **11**. The ratio between the pitches of the threads **17** and **18** is such that when the axis of the cylinder **11** is moved away from or towards the axis of the secondary cylinder **13**, by rotating the spindle **16**, to adjust the relative positions on variation of the diameter of the cylinder **11**, the axis of the web severing device **12** also is moved away from or towards the axis of the cylinder **11** the correct amount to retain the blade **14** and the periphery of the cylinder **11** in their correct relationship.

Although the web **15** is referred to in this specification in the singular, it may, as in the example illustrated, comprise a collection of two or more, for example, four, ribbons **34** which are received separately from the printing machine so that each pull of the web on to the cylinder **11** comprises four superimposed sheets cut from the web. The web is fed from the ribbon collector **23** to the cylinder **11** at a tangent at the line of contact between the cylinder **11** and the blade **14**. The ribbon collector **23** is adjustable on its frame **24** in order to retain this feed position of the web when the diameter of the cylinder **11** is varied.

The primary cylinder **11** has a shaft **25** which has mounted on it two spaced apart end discs **26**, **27** which are free to move axially but keyed so as to rotate with the shaft, each disc being provided with six radial slots **28** equally spaced apart angularly.

Two series of segment support members are provided at each end of the cylinder, the support members **29** of the first series thereof alternating around the discs **26** and **27** with the support members **30** of the second series thereof. Each support member **29** and **30** is provided with a boss which forms a slide **31** to engage in a slot **28** so that the support member may be moved radially of the axis of the shaft **25**.

The cylinder **11** also comprises two series of segmental elements, each of which extends along the cylinder between the two discs **26**, **27**, the segmental elements **32** of the first series thereof alternating around the cylinder with the segmental elements **33** of the second series. Each first segmental element **32** is rigidly connected at each end thereof to a segment support member **29** on each disc **26**, **27**; similarly, each second segmental element **33** is rigidly secured at each end thereof to a segment support member **30** on each disc **26**, **27**. The first segmental elements **32** are secured to their support members **29** in a substantially permanent manner, the term "permanent" in this connection indicating that the segmental element is not normally removed from the support member except for renewal or maintenance purposes. The second segmental elements **33** are secured to their support members **30** in such manner, for example, by screw studs, as to be easily removable therefrom.

The circumferentially directed edges **35** of the second segmental elements **33** overlap the adjacent edges **36** of the first segmental elements **32** (Figs. 2 and 3); the overlapping portions of the second segmental elements **33** have planar inwardly directed surfaces **37** which lie in facial contact with outwardly directed planar surfaces **38** on the peripheries of the first segmental elements **32** when the cylinder is adjusted to the minimum diameter with a particular size set of second segmental elements **33** (Fig. 2); the arrangement is such that no matter to what extent the segmental elements are adjusted radially, the second segmental elements **33** will always overlap the first segmental elements **32** to some extent (Fig. 3), and thereby a substantially continuous periphery is provided for the cylinder.

There may be any plural number of elements in each series of segmental elements, provided there always are

the same number in each series, but it has been found convenient to have three elements in each series, that is, six elements in all. This arrangement makes it very convenient for the primary cylinder to accommodate three pulls of sheets in succession around the cylinder, the peripheral length of the cylinder being adjusted, by radial adjustment of the elements, until said peripheral length is equal to three pulls of sheets. The cylinder is provided with grippers adapted to engage the leading edge of a pull of sheets, web severing elements adapted to co-operate with the rotary severing blade **14** to cut the web immediately in front of the grippers so as to provide a trailing edge to one pull of sheets and a leading edge to the next pull, and tucker blades adapted to press a pull of sheets across a line substantially medially between its leading and trailing edges, outwardly from the primary cylinder so as to be claimed by the gripper elements in the secondary folding cylinder **13**.

There is a complete set of bottom and top grippers **39** and **40**, respectively, and a web severing element **41** in each first segmental element **32**, and a tucker blade **42** associated with each second segmental element **33**. As there is only one severing blade **14** in the severing device **12**, which has to co-operate with all three severing elements **41** on the cylinder **11** in turn, the web severing device **12** will rotate three times to each revolution of the primary cylinder **11**. When the primary cylinder **11** is adjusted, in the manner hereinafter described, for its peripheral length to equal three pulls of sheets, the radial distance of the cutting edge of the blade **14** from the axis of the device **12** also is adjusted so that the blade always will co-operate exactly with the severing elements **41**.

The peripheral length of the primary cylinder **11** is varied by moving all of the segment support members **29**, **30** simultaneously outwardly or inwardly radially on the end discs **26**, **27**. One set of second segmental elements **33** have a sufficient peripheral length to provide for a radial movement of each element of, for example, half an inch, that is a diametral increase of one inch in the cylinder. If it is desired to increase the diameter of the cylinder **11** more than, for example, one inch, then a larger set of second segmental elements **33** are substituted on the support members **30**.

Radial movement of the support members **29** and **30**, and the segmental elements **32** and **33**, relative to the end discs **26**, **27** is effected in the following manner.

A sleeve **43** is mounted, relatively rotatable and axially movable, on the shaft **25** between the end discs **26**, **27**, and this sleeve carries at each end thereof a spiral-threaded annulus or scroll **44**. Each segment support member **29**, **30** carries a spiral-threaded segment or scroll dog **45**. All the scroll dogs **45** on the members **29**, **30** at one end disc **26** are in engagement with the scroll **44** at one end of the sleeve **43**, and similarly all the scroll dogs **45** on the members **29**, **30** at the other end disc **27** are in engagement with the other scroll **44**. When the sleeve **43** and scrolls **44** are rotated relatively to the shaft **25**, the spiral arrangement of the co-operating threads on the scrolls **44** and scroll dogs **45** will cause the support members **29**, **30** to move radially with respect to the shaft **25** and end discs **26**, **27**. Rotation of the sleeve **43** relative to the shaft **25** is effected by a spindle **46** which is mounted, rotatably, in the end disc **26** and is provided at its inner end with a spur wheel **47** which engages a toothed gear **48** on one of the scrolls **44**; the outer end **49** of the spindle **46** is adapted for a key to be applied thereto so that the spindle can be rotated manually.

When radial adjustment of the segmental elements **32**, **33** and their support members **29**, **30** has been effected, they are locked in position, so that they cannot move further radially, by locking the sleeve **43** and scrolls **44** against rotation relative to the shaft **25** and end discs **26**, **27**.

The end discs **26**, **27** are axially movable on the shaft **25**, by means of keys **50**, and the end disc **27** abuts against a collar **51** on the shaft **25**. The end disc **26** is provided externally with an axial boss **52**. A locking ring **53** is rotatably mounted on the shaft **25**, and abuts another collar **54** on the shaft **25**. The ring **53** is in screw-threaded engagement with the boss **52** at **55**, and is provided with worm teeth **56** which are engaged by a worm, not shown, which is rotated manually to effect rotation of the ring **53**. When the ring **53** is rotated, the screw-threaded engagement **55** between the ring and the disc **26**, together with the axial abutment of the ring with the collar **54**, causes the disc **26** to be moved axially along the shaft **25** towards the disc **27**; as axial movement of the disc **27** is limited by the collar **51**, the whole assembly of sleeve **43**, scrolls **44**, scroll dogs **45**, segment support members **29**, **30**, and end discs **26**, **27** are locked frictionally to each other. In order to facilitate this frictional locking engagement, the screw threads on the scrolls **44** and scroll dogs **45** are square so as to provide substantial facial abutment surfaces between tops or outer ends of the teeth on the scrolls and bottoms or roots of the teeth on the scroll dogs. Furthermore, the teeth on the scroll dogs **45** are bounded at either side, in a circumferential direction, with planar surfaces **57**, Fig. 6, in the plane of the roots of the said teeth, which planar surfaces provide additional frictional abutment surfaces for engagement with the tops of the teeth on the scrolls **44**.

The periphery of each first segmental element **32** is arcuate with a radius equal to the smallest radius to which the said element may be adjusted relative to the shaft **25**, whilst the periphery of each second segmental element **33** also is arcuate with a radius equal to the smallest radius to which said element may be adjusted. The cylinder **11** will only be truly circular when the first segmental elements and the smallest set of second segmental elements are in their position of minimum radius. The arcuate lengths of the second segmental elements **33** are such that said elements provide the major portion of the periphery of the cylinder, the exposed arcuate faces of the first segmental elements **32** providing only a small part of the cylinder periphery. The radial adjustment of a certain size of second segmental elements is small, and below or above the radial adjustment limits of said certain size a new set of elements, of smaller or larger size, is mounted on the second support elements. The curvature of the arcuate faces of the first segmental elements conforms to the cylinder diameter at only one setting, the smallest, of the latter, but the exposed portions of said faces of the first segmental elements are so narrow (being overlapped by the second segmental elements), and the range of radial adjustment of second segmental elements of a particular curvature is so small, that any deviation of the cylinder from true circularity is not to great as to interfere with the required working of the cylinder, that is, to operate upon a predetermined length of web.

As indicated hereinbefore, there is a set of bottom and top grippers **39** and **40** at each first segmental element **32**. When the cylinder **11** is not "collecting," the bottom grippers **39** are arranged to operate without gripping, whilst the top grippers **40** operate to grip, by descending on to the bottom grippers **39**, the leading edge of each consecutive pull of sheets. When the cylinder is "collecting," the bottom grippers **39** grip the leading edge of alternate pulls of sheets. In this specification, reference to "collecting" means that two pulls of sheets are collected by the cylinder **11** to form a single signature before they are claimed by the secondary folding cylinder **13**. Alternate pulls are printed similarly, the first pull is taken by the bottom grippers **39** at a position on the cylinder **11**, taken one complete revolution of the cylinder without being claimed by the cylinder **13**, and then a second, differently printed, pull is taken by the top grippers **40**, at the same position, on top of the first pull and on top of the grippers **39**, and both superimposed pulls are taken part of the way round the cylinder **11** before being claimed, as one signature, by the cylinder **13**. The arrangement of three sets of grippers **39**, **40** on the cylinder **11**, at equally spaced angular intervals, ensures that a first pull is collected by the grippers at a single position only once in every two revolutions of the cylinder **11**, a second pull being collected at the same position in the alternate revolution.

Similarly, "non-collecting" in this specification means that only one pull of sheets is taken by the cylinder **11** and transferred as a complete signature to the secondary folding cylinder **13**. A pull of sheets is taken by the top grippers **40** at each revolution of the cylinder **11**, and although the grippers **39** will also operate, they will close before the gripping position, the pull of sheets being gripped between the grippers **39** and **40** each revolution.

The operation of the grippers can be seen from Figs. 5 and 7. In each set of grippers at a position on the cylinder **11** there is a bottom gripper **39** and a top gripper **40** towards each end of the cylinder. Both grippers **39** and **40** at an end are rotatably mounted, separately, on a spindle **58** whose axis is at right angles to the axis of the shaft **25**, the two grippers being disposed side by side and cranked to that the actual operative end **59** of the top gripper **40** is superimposed on the operative end **60** of the bottom gripper **39**. The spindle **58** is mounted in a carrier **61** which is mounted to slide in the segment support member **29** in a direction parallel to the shaft **25**. The two carriers **61**, one at each end of the cylinder, are connected together by a shaft **62** which has a right-hand thread for engagement with one carrier, and a left-hand thread for engagement with the other carrier. A bevel gear wheel **63** (Fig. 5) secured to the shaft **62** is in engagement with a bevel gear wheel **64** on a spindle **65** which is rotatably mounted in a fixed carrier **66** secured to the support member **29**, the outer end **67** of the spindle **65** being adapted for a key to be applied thereto so that the spindle may be rotated manually for setting. When the spindle **65** is rotated, the two carriers **61**, together with the grippers **39**, **40** thereon, are moved towards or away from each other so that the spacing between the grippers at one end of the cylinder from the grippers at the other end may be adjusted to suit the width of sheets which are to be operated upon. A portion **68** of each carrier **61** projects through a slot **69** (through which the grippers also project) in the segmental element **32** so as to lie flush with the surface of said element and cooperate with the grippers **39**, **40** to grip a pull of sheets.

Two shafts **70**, **71** extend between the two support members **29** for a segmental element **32** and are rotatably mounted therein. The two shafts **70**, **71** also pass, rotatably and axially slidable, through both gripper carriers **61**. The shaft **70** carries at each end a bevel gear member **72**, which is slidably keyed thereto in a keyway **73** so as to be rotatable with the shaft but slidable longitudinally thereon, the gear member being mounted within the carrier **61** and being in engagement with a bevel gear member **74** secured to the bottom gripper **39**. When the shaft **70** is moved angularly about its axis, the two bottom grippers **39** also are moved angularly on the spindles **58** so that they can be raised from and returned to the gripping position. Similarly, the shaft **71** carries a slidable gear member **75** at each end on a keyway **76**, the gear members being disposed in the carriers **61** and being in engagement with gear members **77** secured to the top grippers **40** so that angular movement of the shaft **71** will cause the grippers **40** to rise or fall so as to release or grip sheets.

The shaft **70** carries a gear wheel **78**, keyed thereto, which meshes with another gear wheel **79** on a spindle **80**, the latter spindle carrying a crank **81** on the outer end of which is a crank pin **82**, the spindle **80** being rotatably mounted in the segment support member **29** at one end

of the cylinder. Similarly, the shaft **71** carries a gear wheel **83** keyed thereto, which meshes with another gear wheel **84** on a spindle **85** which in turn carries a crank **86** on the outer of which is a crank pin **87**, the spindle **85** being rotatably mounted in the segment support member **29** at the other end of the cylinder.

The crank pin **82** is engaged by a slot **88** in the free end of a lever **89** (Figs. 4, 5 and 9) which is pivotally mounted at **90** on the end disc **27** and which carries a cam follower **91** which co-operates with a cam track **92**. The cam track **92** is rigidly mounted in a cam carrier **93** which is rotatable relative to the shaft **25** and has an internal toothed gear **94**. An external toothed gear wheel **95** is mounted rigidly on a carrier **96** which also is rotatable relative to the shaft **25**. The two gears **94** and **95** are interconnected by planet wheels **97** which are rotatably mounted on pins **98** secured to the end disc **27**. Either the cam carrier **93** or the gear wheel carrier **96** can be rigidly secured to the frame **99** of the folding machine by a dog **100** which is carried on a shaft **101** which is rotated by a cranked handle **102**, the dog **100** engaging one of the co-operative recesses **103** or **104** to secure the cam carrier **93** or the gear carrier **96**, respectively, to the frame, the cranked handle **102** being secured to the frame in the selected position by a spring-pressed stud **105** engaging in either of recesses **106** or **107**.

When the cam carrier **93** is locked to the frame **99**, the cam track **92** is stationary and the bottom grippers **39** are actuated to open and close once during every revolution of the cylinder **11**, the open position being determined by the radially outermost portion **108** of the cam track; this is the "non-collecting" position.

When the gear carrier **96** is secured to the frame **99**, the cam carrier **93** rotates around the shaft **25** and gear carrier **96** at a speed ratio to the cylinder of three to two, in the same direction, that is, the cam track completes one revolution whilst the cylinder makes two-thirds of one revolution; consequently, if the cylinder rotates in the direction of the arrow, Fig. 4, then the grippers **39** at each of the three positions on the cylinder, that is, positions A, B and C, will be actuated to open in succession in that order, and therefore the grippers **39** at any one position will be opened once in every two revolutions of the cylinder. This is the "collecting" condition.

The crank pin **87** is operated by a similar assembly at the end disc **26**, namely, a slot **109** in a lever **110** which is pivoted at **111** on the disc **26** and which carries a cam follower **112** which engages a cam track **113** mounted in a cam carrier **114**; however, the cam carrier **114** is always rigidly secured to the frame **99** so that the grippers **40** are opened once during each revolution of the cylinder, whether the cylinder is set for "non-collecting" or "collecting."

The arrangement of the levers **89** and **110**, with the slots **88** and **109**, is such that in the closed position of the grippers **39** and **40** the said slots and the cranks **81** and **86** are radial of the cylinder, and are aligned, so that outward or inward radial adjustment of the segmental elements **32**, carrying the grippers, may be effected whilst retaining the crank pins **82** and **87** in correct positional relationship with said slots throughout all such adjustments.

The web severing element **41** in each segmental element **32** comprises a slot (Fig. 1) which is slightly in advance, in the direction of rotation of the cylinder **11**, of the grippers so that the web is severed slightly in advance of the gripping position.

The signature tucker means comprises a blade **42** approximately at the centre of each segment support member **30** and adapted to be projected through a slot **115** (Fig. 5) in the segmental element **33**. The blade **42** is mounted on a rocker frame **116** (Fig. 8) which is adjustably secured to a spindle **117** by studs **118**, the spindle **117** being rotatably mounted in bearings in the two support members **30** for a segmental element **33**. A crank **119** is mounted on a shaft **120**, which is rotatably mounted in the support member **30** at one end of the element **33**, a gear member **121** on the shaft **120** meshing with a gear member **122** on the spindle **117**. The crank **119** carries a cam follower **123** on its outer end and said cam follower is adapted to engage a fixed cam **124** on the machine frame **99** each time the cylinder rotates in such manner that when the cam follower **123** is pressed inwardly of the cylinder by the cam **124** the blade **42** is pressed outwardly of the cylinder through the slot **115** whereby to press sheets which lie around the cylinder and across said slot into gripper elements **125** on the secondary folding cylinder **13**. Simultaneously with the sheets being claimed by the cylinder **13** they are released by the grippers **39** and **40**. Normally, the crank **119** is pressed outwardly by a spring **126**, and its outward movement is limited by a stop **127**.

The secondary folding cylinder **13** is provided with two diametrically opposed positions for gripper elements **125**. The cylinder **13** is adapted to rotate once to each two-thirds of a revolution of the cylinder **11** so that a claiming jaw position registers with every slot **115** during every revolution of the cylinder **11**. If the cylinder **11** is set for "non-collecting," the claiming jaws **125** are mounted in both positions on the cylinder **13** so that sheets are claimed from the cylinder **11** every time a slot **115** and tucker blade **42** passes the cylinder **13**. If, however, the cylinder **11** is set for "collecting," the claiming jaws **125** are mounted at one position only on the cylinder **13**; thereby, although the tucker blades **42** will press out the sheets from the surface of the cylinder **11** every time they pass the cylinder **13**, the sheets only at alternate tucker blades will be claimed by the cylinder **13**. This arrangement enables alternate claiming of the pulls of web to be effected without having to incorporate selecting mechanism in the cylinder **13** to effect alternate tucking. The position of the cam followers **123** in relation to the fixed cam **124** is substantially constant at all diameters of the cylinder **11**, the line of contact between the cylinders **11** and **13** being constant and the fixed cam **124** being disposed near to said line of contact.

Although, with some diameters of the primary cylinder **11**, there may be a difference in surface speed between the said cylinder and the secondary folding cylinder **13**, it has been found that this difference creates no difficulty, and that careful setting of the tucker blades **42** and the gripper elements **125** will enable satisfactory transfer of a signature from the primary cylinder **11** to the secondary cylinder **13** to be effected despite the different speeds of the parts.

What we claim and desire to secure by Letters Patent is:

1. A primary cylinder for a variable size paper folding machine, said cylinder having its periphery provided by two series of segmental elements, each series comprising at least two segmental elements, the elements of the first series thereof alternating circumferentially with the elements of the second series, said segmental elements being adjustable radially of the cylinder axis whereby the diameter of said cylinder may be varied, means for mounting said elements for enabling said radial adjustment of the said elements to be effected, said means comprising a shaft disposed axially of the cylinder, two end discs mounted on said shaft for rotation therewith, said end discs each being provided with radial slots equiangularly spaced therearound, the number of slots in each end disc corresponding to the total number of segmental elements in both series thereof, and a slide element mounted in each said slot and adapted to slide therein radially of the shaft axis, each said segmental element being secured at opposite ends to a said slide element on each said end disc.

2. A primary cylinder according to claim 1 wherein

the elements of said second series thereof each have their edges in the circumferential direction overlapping the adjacent edges of the elements of said first series thereof.

3. A primary cylinder according to claim 1, wherein the elements of the first series thereof are permanently mounted in the cylinder, and the elements of the second series thereof are removably mounted in the cylinder whereby second series elements of various radii and arcuate lengths may be mounted in the cylinder.

4. A primary cylinder according to claim 1 wherein two scrolls having a spiral screw thread thereon are rotatably mounted on said shaft and are connected together for synchronous rotation, scroll dogs are mounted on each said slide element, said scroll dogs being provided with segments of spiral screw threads, the screw threads on the scroll dogs and the scrolls being in co-operative co-action whereby when the scrolls are rotated on said shaft the slide elements are caused to move radially of the shaft.

5. A primary cylinder according to claim 4 wherein said end discs and scrolls are movable axially on the said shaft, fixed abutments on the shaft are provided outwardly of said end discs, and means are provided to move said end discs and said scrolls between said abutments and axially of the shaft whereby the said end discs and scrolls can be so moved towards one abutment as to be clamped frictionally to each other to prevent relative rotation.

6. A primary cylinder according to claim 5 wherein the means for effecting axial movement of the end discs and the scrolls axially of the shaft between said abutments comprises a screw-thread device between one said abutment and a said end disc whereby said end disc may be moved axially relatively to said abutment.

7. A primary cylinder according to claim 1 wherein sheet gripping devices are mounted on the segmental elements of the first series thereof, lever means are pivotally provided on the end discs to effect angular movement of said sheet gripping devices, a cam track is provided on a supporting frame for the cylinder whereby there is relative rotation between the cam track and cylinder, a cam follower is provided on said lever means in operative engagement with said cam track, and the operative engagement between said lever means and said sheet gripping device is effected by means comprising a crank on a spindle on which the gripping devices are mounted, a crack pin on said crank, and a slot in said lever, the said crank pin and said slot being in operative engagement with each other, the said slot and the said crank being disposed radially of the cylinder shaft axis when the gripping devices are in the sheet gripping position.

8. A primary cylinder according to claim 1 wherein sheet tucker means, for co-operation with claiming means on a secondary folding cylinder of the folding machine, are mounted on a spindle in the segmental elements of the first series thereof, a crank having a crank pin thereon is mounted on said spindle, and a cam is mounted in a fixed position on a supporting frame for the primary cylinder whereby there is operative engagement between said cam and said crank pin to actuate said tucker means on each revolution of the primary cylinder.

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