

[54] SIGNATURE CUTTING AND TRIMMING APPARATUS

3,088,731 5/1963 Raybuck ..... 270/72  
 3,544,454 12/1970 Muth et al. .... 270/72  
 2,985,449 5/1961 Dietrich ..... 270/50

[75] Inventors: Robert Munn, Monsey; Albert Tiso, Scarsdale, both of N.Y.

[73] Assignee: George Hantscho Company, Inc., Mt. Vernon, N.Y.

Primary Examiner—Robert W. Michell  
 Assistant Examiner—A. Heinz  
 Attorney—Eugene E. Geoffrey, Jr.

[22] Filed: May 28, 1971

[21] Appl. No.: 147,754

[52] U.S. Cl. .... 270/69, 270/72

[51] Int. Cl. .... B65h 45/00

[58] Field of Search ..... 270/71-72,  
 74-75, 49-50, 63, 21, 69

[57] ABSTRACT

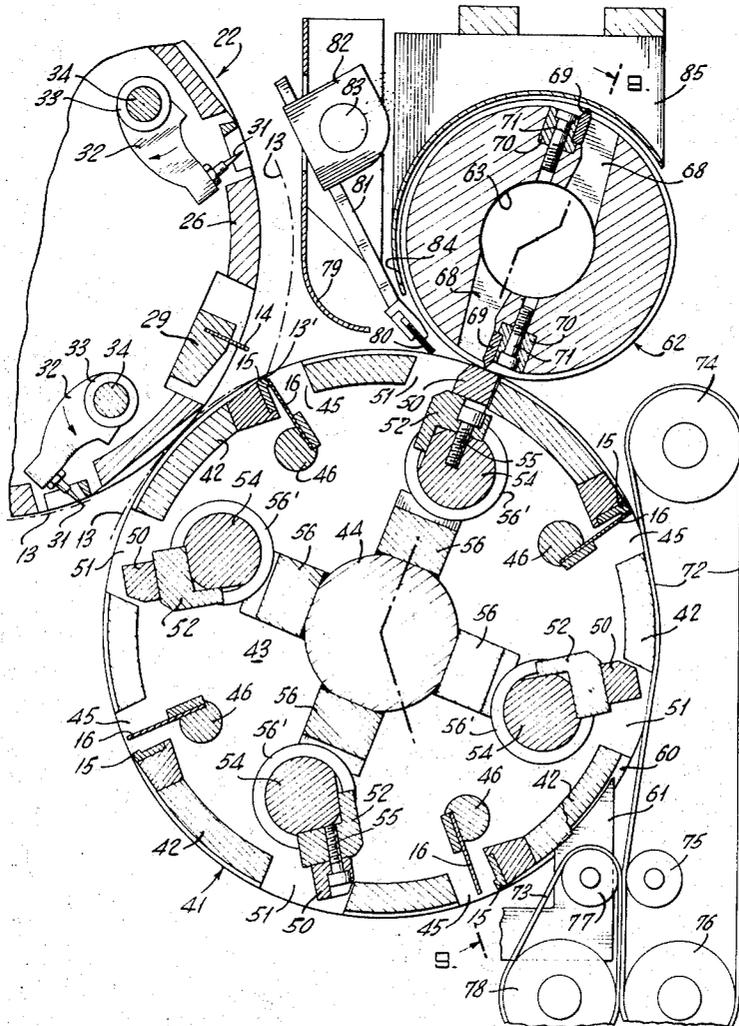
Apparatus for use with printing presses to cut, fold and trim each individual signature and deliver the completely trimmed signature to succeeding folding or stacking stations.

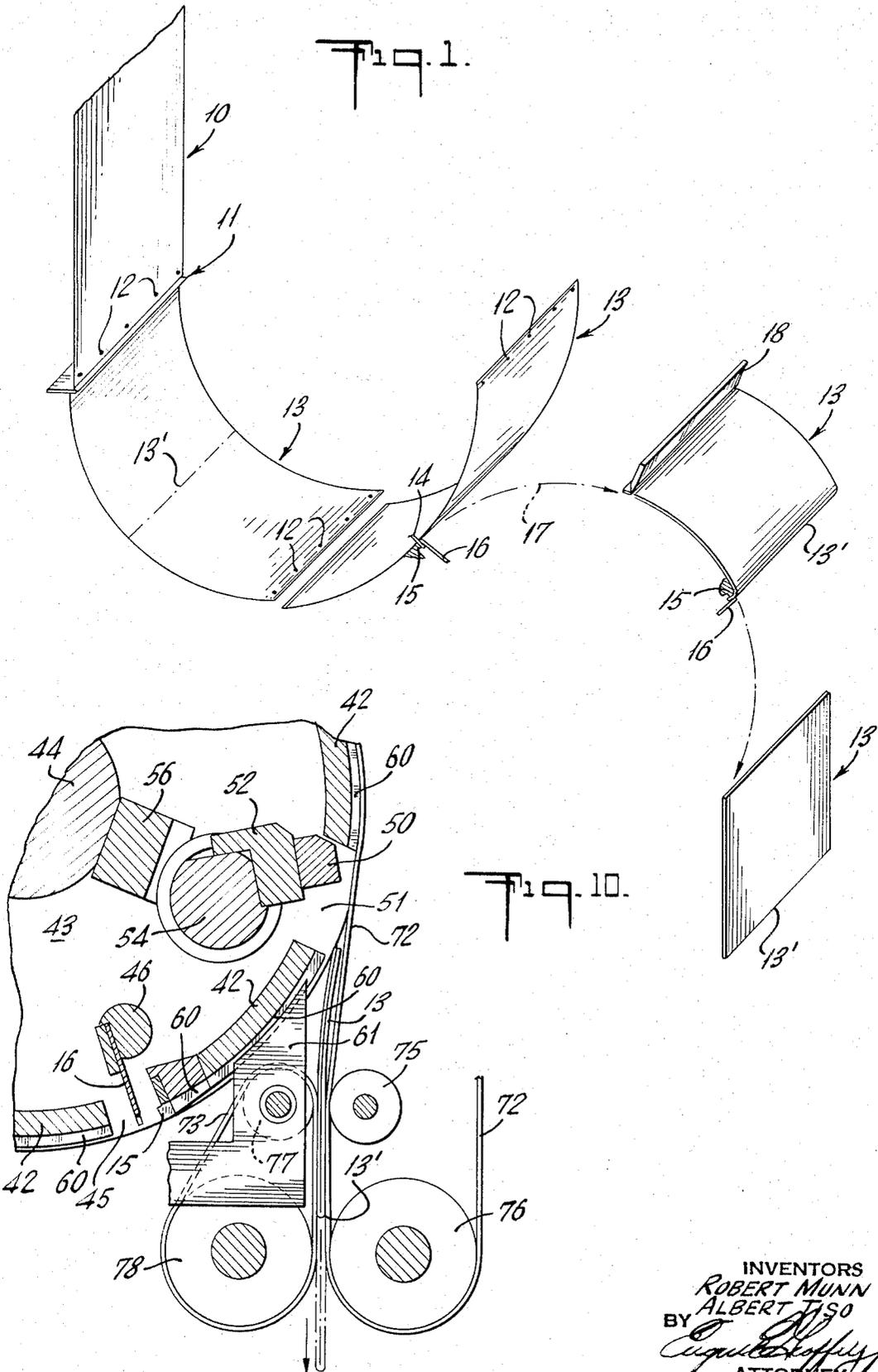
[56] References Cited

UNITED STATES PATENTS

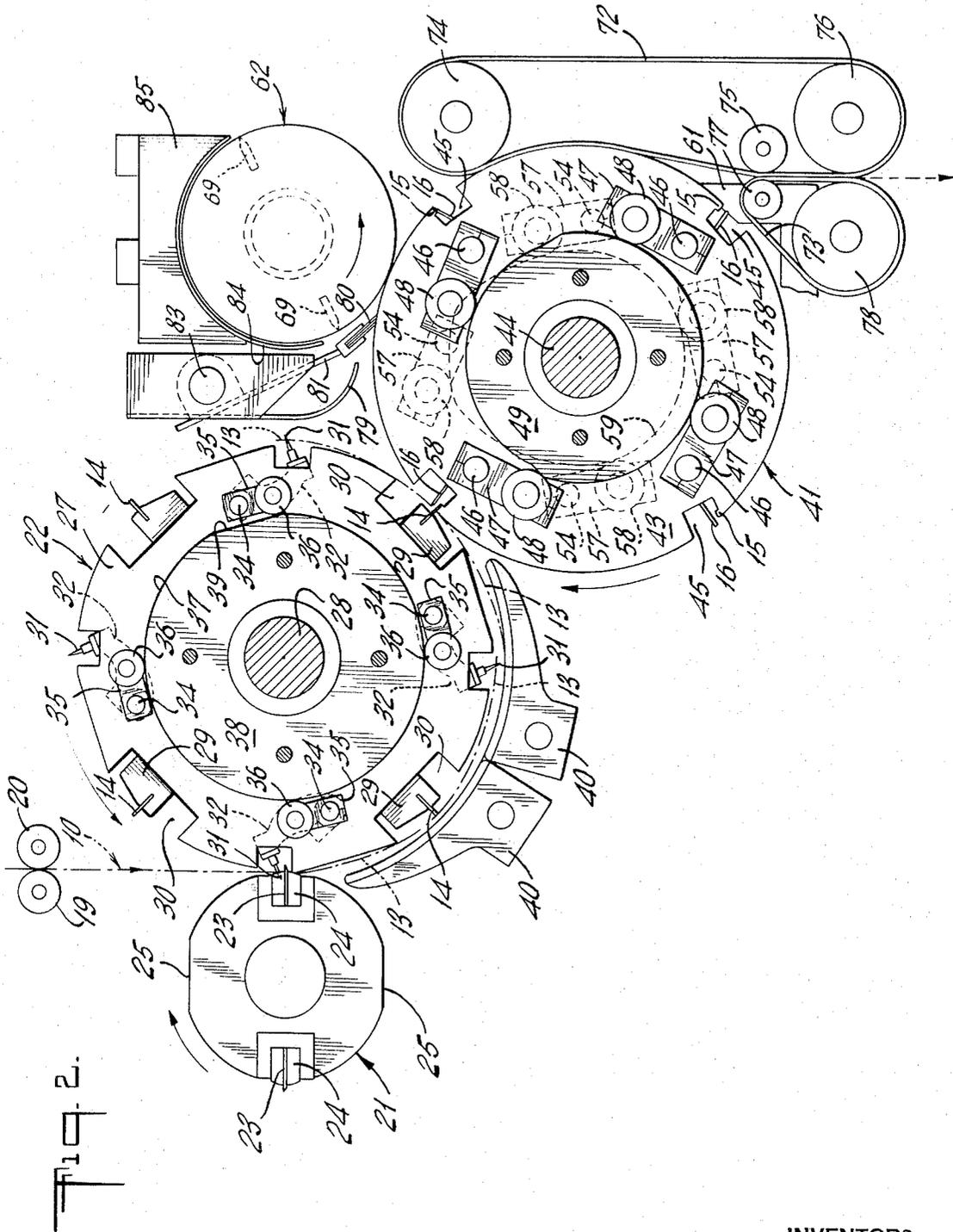
2,659,437 11/1953 Huck ..... 270/63

14 Claims, 10 Drawing Figures

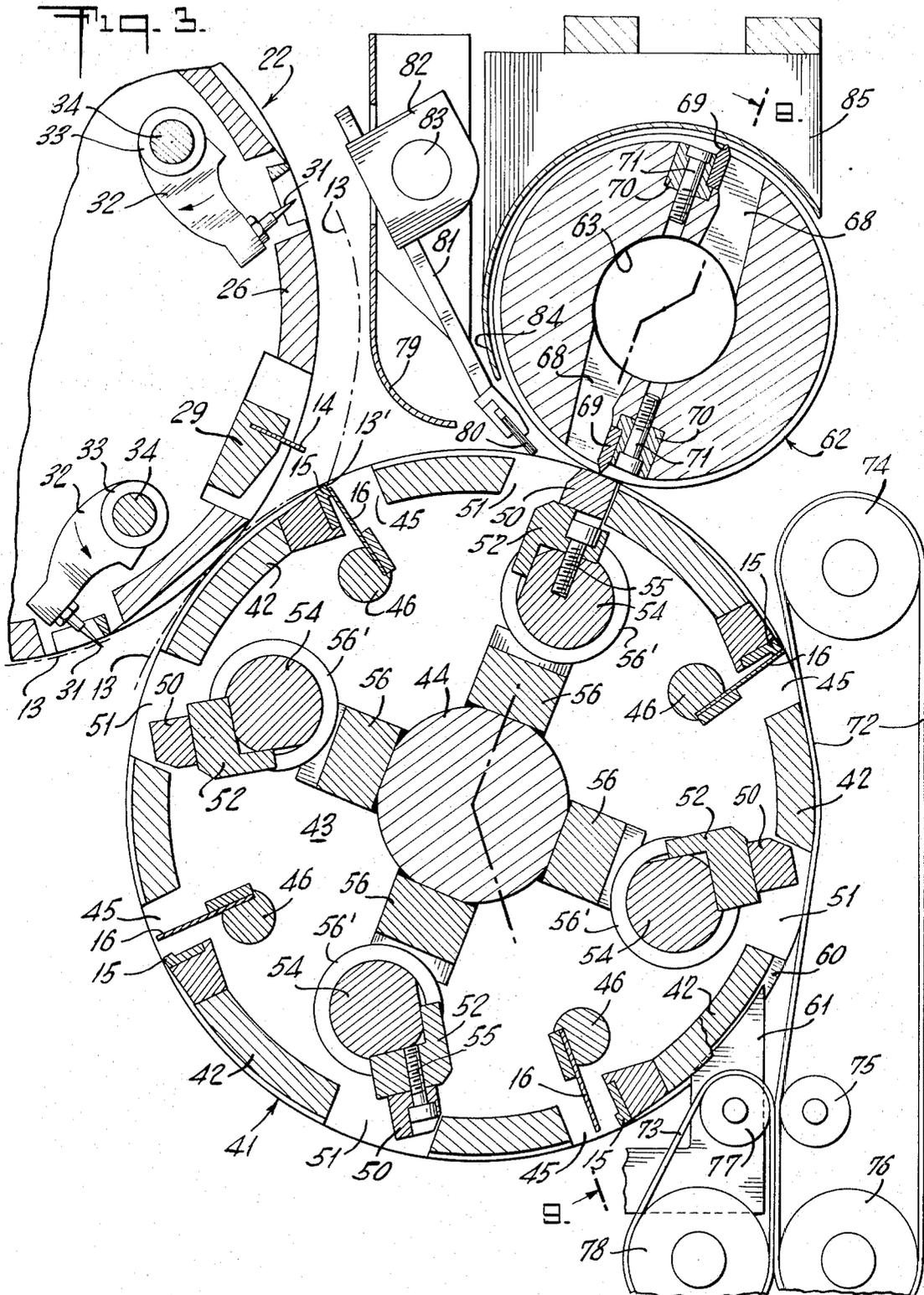




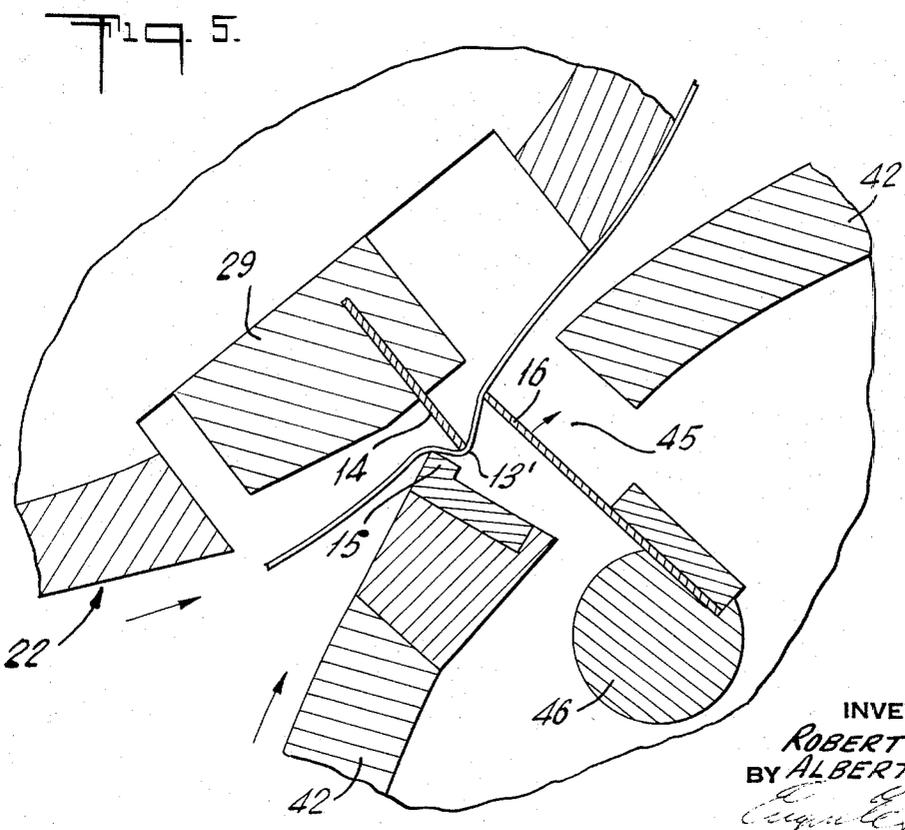
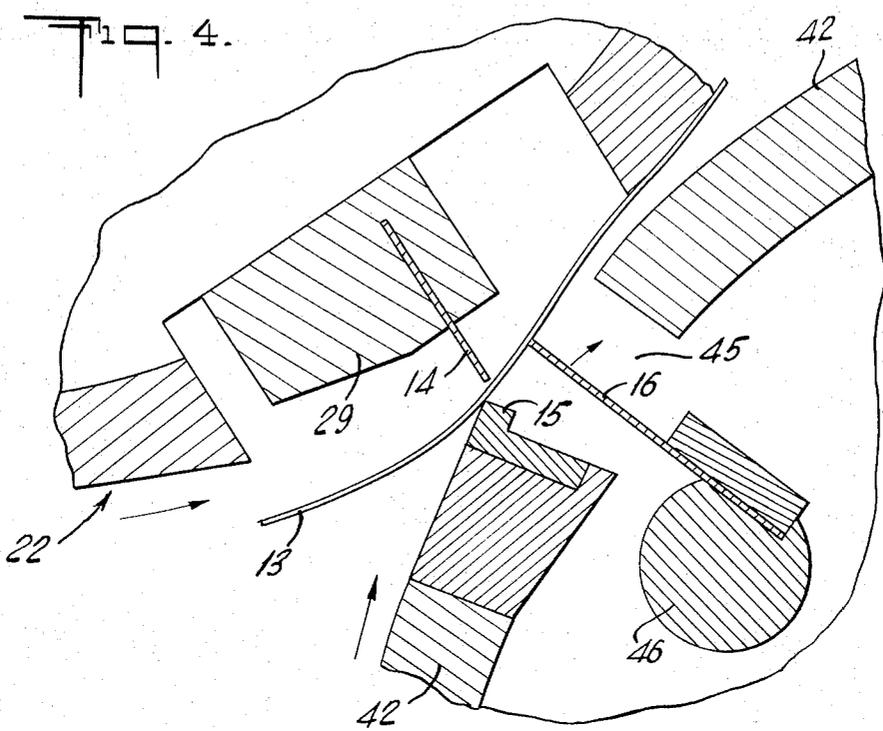
INVENTORS  
ROBERT MUNN  
ALBERT TISO  
BY *Albert Tiso*  
ATTORNEY



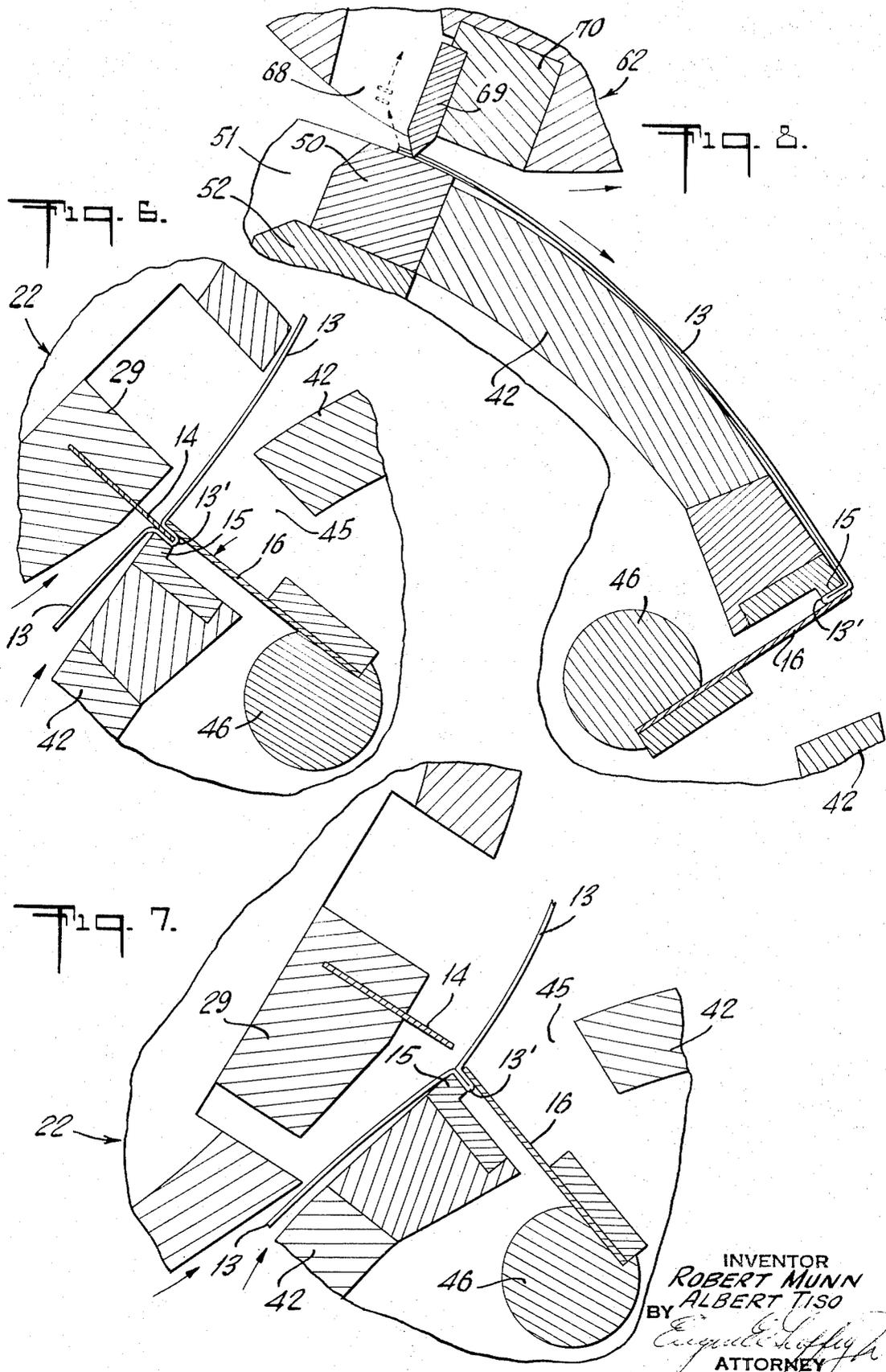
INVENTORS  
ROBERT MUNN  
ALBERT TISO  
BY *Engel & Hoffmann*  
ATTORNEY



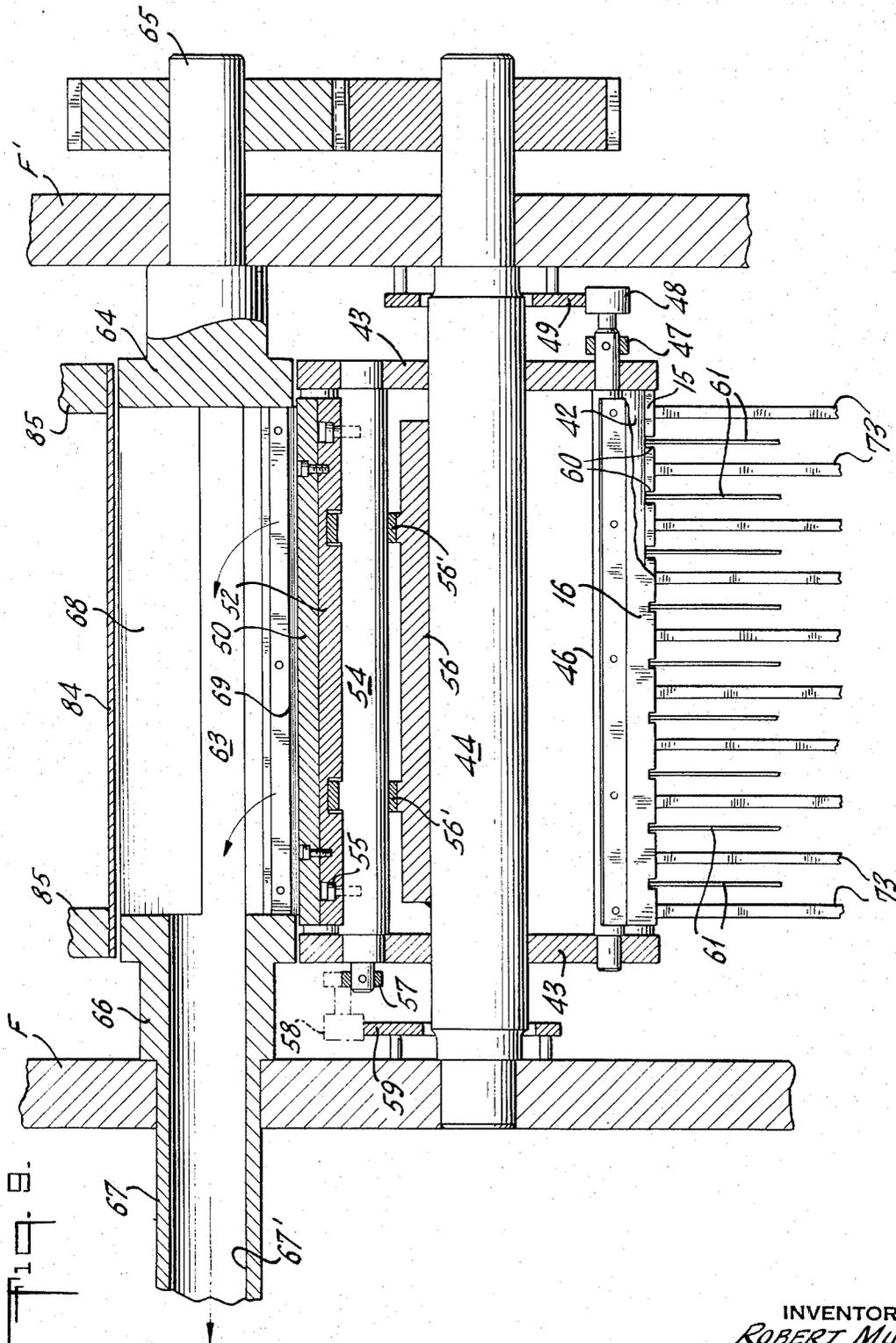
INVENTORS  
ROBERT MUNN  
BY ALBERT TISO  
ATTORNEY



INVENTORS  
ROBERT MUNN  
BY ALBERT TISO  
*Albert Tiso*  
ATTORNEY



INVENTOR  
ROBERT MUNN  
ALBERT TISO  
BY *Ernest C. Hoff*  
ATTORNEY



INVENTORS  
ROBERT MUNN  
ALBERT TISO  
BY *Albert Tiso*  
ATTORNEY

## SIGNATURE CUTTING AND TRIMMING APPARATUS

This invention relates to printing apparatus and more specifically to novel and improved apparatus for severing signatures from a printed web and precisely folding and trimming each printed signature prior to delivery to stacking or other processing apparatus.

Heretofore the printed web upon leaving the printing apparatus, such as an offset press or the like, was severed longitudinally to form individual strips of signatures and then the signatures of a strip were individually severed, folded and then stacked. Upon severing the signatures, the leading edge of each severed signature was engaged by pins which carried the signature to suitable folding apparatus. With this procedure it was necessary to trim the pierced edges of the stacked signatures and provide a border of the desired width. Such procedures, however, are time consuming and add material cost to the finished product.

This invention overcomes the problems heretofore encountered in folding and trimming signatures by providing novel and improved means for precisely folding successive signatures, trimming the trailing edge of each folded signature, automatically removing the trimmed waste and then delivering the precisely trimmed and folded signatures to suitable stacking apparatus.

Another object of the invention resides in the provision of novel and improved folding and trimming apparatus for signatures which can receive a web from a printing press, sever the signatures from the web, and then fold and precisely trim the individual signatures at a rate equivalent to the rate of travel of the web through the press.

Still another object of the invention resides in novel and improved rotary apparatus for folding and trimming signatures and automatically delivering the completed and folded signature to stacking or other apparatus for disposition of the completed signature.

The above and other objects and advantages of the invention will become more apparent from the accompanying drawings and the following description.

In the drawings:

FIG. 1 is a diagrammatic illustration of the steps of severing individual signatures, folding the signatures and then upon precisely trimming each signature delivering it to stacking or other apparatus;

FIG. 2 is a side elevational view in partial section illustrating one embodiment of signature folding and trimming apparatus in accordance with the invention;

FIG. 3 is an enlarged cross-sectional view of the folding and trimming apparatus illustrated in FIG. 2;

FIG. 4 through 8 are enlarged fragmentary cross-sectional views of portions of FIG. 3 showing the successive steps in the folding and trimming signatures in accordance with the invention;

FIG. 9 is a cross-sectional view of FIG. 3 taken along the line 9—9 thereof; and

FIG. 10 is an enlarged fragmentary cross-sectional view of a portion of FIG. 3 illustrating the apparatus for removing the completed and trimmed signatures.

For a general understanding of the operation of the apparatus in accordance with the invention, reference is made to FIG. 1 illustrating diagrammatically the path of the movement of each signature severed from a printed web in the performance of the folding and trimming operations in accordance with the invention. The

web generally denoted by the numeral 10 and which consists of a plurality of signatures in end to end relationship is periodically severed by a blade 11. Just prior to the time at which a signature is severed from the web, the edge of the web 10 immediately in advance of the blade 11 is gripped by a plurality of pins at positions represented by the dots 12. The pins as will be described extend from the surface of a roller and carry the signature 13 through an arcuate path. The center line 13' of the signature 13 is then forced by a blunt edged blade 14 between a fixed jaw 15 and a movable jaw 16 which grip the signature and move it through a reverse arcuate path represented by the dotted line 17. After a precise angular displacement of the signature 13, a cutting blade 18 precisely trims the trailing edge of the signature. Thereafter the jaw 16 is released and the folded and trimmed signature is engaged by apparatus for delivery to stacking or other apparatus.

The apparatus for performing the operations described in connection with FIG. 1 is illustrated in FIGS. 2 through 10. Referring more specifically to FIG. 2, the printed web or strip of signatures 10 is fed downwardly by a pair of rollers 19 and 20 between a cutting cylinder 21 and a transporting and folding cylinder 22. The cutting cylinder 21 is provided with a pair of longitudinally disposed knife blades 23 positioned precisely 180° apart and supported by suitable holders 24 to facilitate replacement. The cutting cylinder further includes a pair of diametrically opposed flattened portions 25 spaced 90° from the cutting blades 23 to provide clearance for the folding blades carried by the transporting and folding cylinder 22.

The transporting and folding cylinder 22, which may be observed more clearly in FIG. 3 is in the form of a hollow cylinder 26 having end plates 27 on each end thereof and is carried by a shaft 28. Four folding blades 14 are disposed at 90° intervals about the periphery of the cylinder 22 and each blade 14 is carried by a longitudinal support 29 disposed within a recess 30 and spans the end plates 27. With this arrangement only the folding blades 14 protrude from the periphery of the cylinder 27, and the flattened portions 25 on the cylinder 21 are of sufficient depth to clear the blades 14.

Four longitudinal sets of pins 31 are also carried by the transporting and folding cylinder 22 and are disposed at 90° intervals and offset from the blades 14 by approximately 45°. The pins 31 of each set are carried by individual rocker arms 32 as will be observed more clearly in FIG. 3 and each rocker arm is provided with a collar fixedly secured to a shaft 34 which is rotatably carried by the end plates 27. One end of each shaft 34 carries a lever arm 35 having a cam wheel 36 rotatably carried thereby. The four cam wheels 36 ride on the periphery 37 of the cam 38, the latter being carried by the supporting frame F' (see FIG. 9) so that the cylinder 22 rotates relative to the cam 38. The cam 38 includes a flattened portion 39 to permit retraction of each set of pins in order to release the signatures at the time of the folding operation. It is understood that suitable spring means are provided for each set of pins 31 for normally urging the pins into the retracted position.

With the apparatus thus far described, as the web or strip of signatures 10 moves downwardly, a cutting blade 23 on the cylinder 21 will sever a signature when the blade is in the position shown in FIG. 2. At the same time the transporting and folding cylinder 22 which operates at the same peripheral speed as the cylinder 21

is coordinated with the cylinder 21 so that a set of pins 31 will pierce the edge of the web 10 in advance of the blade 23 and thereby carry the web 10 downwardly and about the cylinder 22. Continued rotation of the two cylinders will bring a folding blade 14 into engagement with the center line 13' of the successive signature while the severed signature moves downwardly about the cylinder 22 and is prevented from disengagement with its set of pins 31 by guides 40.

The folding and trimming cylinder (shown in FIGS. 2, 3, and 9) is generally denoted by the numeral 41 and formed of a hollow shell 42 and a pair of end plates 43 carried by a central shaft 44. The cylinder 41 has longitudinal slots 45 disposed at 90° intervals and opening into the end plates 43. The trailing edge of each slot extends slightly beyond the adjoining wall of the recess to form a fixed jaw 15 for cooperation with the movable jaw 16 to fold and grip the signatures just prior to the trimming operation. The movable jaws 16 as shown more clearly in FIG. 3 are each carried by a longitudinal shaft 46 which is pivotally carried by the end plates 43 of the cylinder 41. The right end of each shaft 46 as viewed in FIG. 9 carries an arm 47 secured thereto and the outer end of the arm carries a rotatable mounted cam wheel 48. The four cam wheels 48 ride on the surface of a fixedly mounted cam 49 shown in solid outline in FIG. 2 and at the right in FIG. 9 and is secured to the frame F'. With this arrangement as the cylinder 41 rotates in a clockwise direction, the movable jaws 16 will move toward and away from the fixed jaws 15. Suitable springs not shown, are utilized to bias the jaws 16 to the closed position.

The cylinder 41 further includes four retractable anvils 50 spaced at 90° intervals and disposed within elongated openings 51 in the cylinder wall 42. Each elongated anvil is carried by an L-shaped block 52 and secured thereto by a plurality of recessed screws 53. The four L-shaped blocks 52 are each secured to a shaft 54 by screws 55 and the shaft extends between and is pivoted in the end plates 43. Inasmuch as the anvils 50 are subjected to substantial pressure in the trimming operation to be described, each shaft 54 is supported at intermediate positions by a block 56 and bearings 56' carried by the shaft 44 as viewed more clearly in FIG. 9. The shafts 54 extend through the left end plate 43 of cylinder 41 as viewed in FIG. 9 and each shaft carries an operating arm 57. The outer end of each arm 57 includes a cam roller 58 which rides on a cam 59 fixedly secured to the frame F. In this way the anvils are readily movable from a retracted position to a position wherein the surface of the anvil is substantially coincident with the surface of the cylinder as will be observed more clearly in FIG. 3. The surface of the cylinder 41 also is provided with a plurality of spaced annular grooves 60 as observed in FIGS. 3 and 9 for receiving a plurality of stripper plates 61 which function to remove the folded and trimmed signatures from the cylinder 41.

The trimming cylinder generally denoted by the numeral 62 has a relatively large passage way 63 extending therethrough. The cylinder has a solid end plate 64 and shaft 65 on one end thereof for rotatably supporting it in the frame member F' as will be viewed in FIG. 9 and the other end is provided with a hollow end plate 66 and hollow shaft 67 rotatably carried in the frame member F. In this way vacuum applied to the passage 67' in the shaft 67 will be applied to the passage 63

within the cylinder 62. The cylinder 62 is further provided with generally radially disposed longitudinal passages 68 extending from the surface of the cylinder to the passage 63. Diametrically opposite cutting blades 69 removably carried by blocks 70 are secured to the cylinder 62 adjoining the edges of the passages 68 by screws 71. The cutting blades 69 protrude from the surface of the cylinder 62 so that as the cylinder 62 is driven in synchronism with the cylinder 41, the blades 69 will engage successive anvils 50.

Removal of the folded and trimmed signatures from the cylinder 41 is accomplished by two sets of belts 72 and 73 with the belts 72 being carried by rollers 74, 75, and 76 and belts 73 being carried by rollers 77 and 78. In this way the completed signatures are held between the cylinder 41 and the belts 72, and as they move downwardly are stripped from the cylinder by the strippers 61 whereupon they move downwardly between the two sets of belts 72 and 73. The apparatus further includes a guide plate 79 for folding the leading half of each signature in the course of being folded and a smoothing element 80 carried by an arm 81 secured to brackets 82 rotatably carried by a shaft 83. The smoothing member 80 causes the folded signatures to lie flat against the cylinder 41 just prior to the trimming operation as will be described.

As previously pointed out, each individual signature severed from the web or strip 10 is carried by a set of pins 31 shown in FIG. 2. When a set of pins 31 carrying a signature approaches the position of the pins on the righthand side of the cylinder 22 as shown in FIG. 2, the trailing folding blade 14 will force the center of the signature between the fixed jaw 15 and the movable jaw 16, the latter having been moved away from the fixed jaw as will be observed more clearly in FIG. 4. In FIG. 5 the folding blade 14 has entered the space between the jaws 15 and 16 while in FIG. 6 the jaw 16 has been moved to a closed position with the signature 13 tucked therebetween. Continued rotation causes the folding blade 14 to move out of engagement with the signature 13 and leave the latter firmly clamped between the fixed and movable jaws 16 as shown in FIG. 7.

As the cylinder 41 continues to rotate in a clockwise direction, the guide 79 will cause the leading half of the signature 13 to be folded back upon the trailing half of the signature and continued movement causes the smoothing element 80 to cause the two halves of the signature to lie flat against the cylinder 41. In the meantime the cam 58 is displacing the anvil from its retracted position to the cutting position as shown in FIG. 3 and simultaneous rotation of the cutting cylinder 62 will cause a cutting blade 69 to engage the trailing edge of the signature between it and the associated anvil 50 to precisely trim the trailing edge of the signature as shown in FIG. 8. The trimmed portion of each signature or scrap is then removed through one of the vacuum passages 68 adjoining the cutting blade 69 and is discharged through the passages 63 and 67' as shown in FIG. 9. When the trimmed signature is engaged by the series of belts 72, cam 49 operates to open the movable jaw 16 whereupon the stripper blades 61 remove the signature from the surface of the cylinder 41 and direct it downwardly between the set of belts 72 and 73 as shown in FIG. 10. It will also be observed that the anvils are retracted immediately after the trimming operation to avoid interference with the pins 31 on the

transporting and folding cylinder 22 stripper blades 61 and belt 72. In order to avoid loss of vacuum on the cutting cylinder 62, the top portion of the cylinder is surrounded by a shell 84 carried by a supporting frame 85 in order to restrict the intake of air through the passage 68 which is diametrically opposite the cutting position.

With the apparatus as described above, individual signatures can be severed from the web at the same rate of speed employed in the printing operation and automatically folded and then precisely trimmed prior to the stacking operation. Inasmuch as the side edges of the signatures can be precisely trimmed by longitudinal cutting means, precision trimming of the trailing edges of each folded signature by apparatus in accordance with this invention provides precisely dimensioned signatures which are ready for either additional folding or stacking operations as the case may be.

While only one embodiment of the invention has been illustrated and described, it is apparent that alterations, modifications and changes may be made without departing from the true scope and spirit thereof as defined by the appended claims.

What is claimed is:

1. Apparatus for folding and trimming signatures cut from a continuously advancing strip comprising first and second rotary cylinders having means thereon for cutting successive signatures from the advancing strip, a third rotary cylinder, means disposed on the peripheries of said second and third rotary cylinders for successively folding each cut signature at a predetermined distance from the leading edge thereof and move the leading half of the signature into overlying relationship with the trailing half, said third cylinder having means for gripping the folded edge of each cut signature, a fourth rotary cylinder, means disposed on the peripheries of said third and fourth rotary cylinders for trimming the trailing edges of each folded signature, vacuum means contained within and communicating with the surface of said fourth cylinder for removing the trimmed waste at the point of cutting, and means for removing the trimmed signatures.

2. Apparatus according to claim 1 including means disposed on the periphery of said second rotary cylinder for gripping the leading edge of each cut signature and means for holding the trailing portion of the cut signature in close proximity to the peripheral surface of said second rotary cylinder.

3. Apparatus according to claim 2 wherein said holding means comprises at least one longitudinal shaft within and adjoining the surface of said second cylinder, a plurality of pins carried by said shaft, a cam follower assembly secured to said shaft and a cam cooperating with said cam follower assembly to move said pins to and from a position extending from the surface of the last said cylinder during rotation thereof.

4. Apparatus according to claim 3 wherein said folding means comprises at least one folding blade on said second rotary cylinder, a pair of relatively movable jaws on said third rotary cylinder and means for rotating said cylinders in synchronism whereby said blade tucks said signature between said jaws which clamp the folded edge of the signature and permit withdrawal of the blade.

5. Apparatus according to claim 4 including a fixedly mounted jaw operating cam spaced from one end of said third rotary cylinder and cam follower means cou-

pled to at least one of said jaws for moving it relative to the other jaw.

6. Apparatus according to claim 5 wherein said trimming means includes at least one elongated anvil carried by said third rotary cylinder and movable to and from a position wherein the surface of said anvil is in approximate alignment with the surface of said cylinder and said fourth rotary cylinder includes at least one cutting blade cooperating with said anvil to trim the trailing edge of the folded signature.

7. Apparatus according to claim 1 wherein said folding means comprises at least one folding blade on said second rotary cylinder, a pair of relatively movable jaws on said third rotary cylinder and means for rotating said cylinders in synchronism whereby said blade tucks said signature between said jaws which clamp the folded edge of the signature and permit withdrawal of the blade.

8. Apparatus according to claim 7 including a fixedly mounted jaw operating cam spaced from one end of said third rotary cylinder and cam follower means coupled to at least one of said jaws for moving it relative to the other jaw.

9. Apparatus according to claim 1 wherein said trimming means includes at least one elongated anvil carried by said third rotary cylinder and movable to and from a position wherein the surface of said anvil is in approximate alignment with the surface of said cylinder and said fourth rotary cylinder includes at least one cutting blade cooperating with said anvil to trim the trailing edge of the folded signature.

10. Apparatus for folding and trimming signatures cut from a continuously advancing strip comprising first and second rotary cylinders having means thereon for cutting successive signatures from the advancing strip, a third rotary cylinder, means disposed on the peripheries of said second and third rotary cylinders for successively folding each cut signature at a predetermined distance from the leading edge thereof and move the leading half of the signature into overlying relationship with the trailing half, a fourth rotary cylinder, means disposed on the peripheries of said third and fourth rotary cylinders for trimming the trailing edges of each folded signature, vacuum means for removing the trimmed waste, and means for removing the trimmed signatures, said trimming means including at least one elongated anvil carried by said third rotary cylinder and movable to and from a position wherein a surface of said anvil is in approximate alignment with the surface of said cylinder, said fourth rotary cylinder including at least one cutting blade cooperating with said anvil to trim the trailing edge of the folded signature, a fixedly mounted anvil operating cam spaced from one end of said third rotary cylinder and cam follower means coupled with said anvil and engagable with said cam to move said anvil to and from said position.

11. Apparatus according to claim 10 wherein said vacuum means includes a passage extending through said fourth rotary cylinder and at least one elongated channel extending from the surface of said fourth cylinder and communicating with said passage, said channel being disposed on the trailing side of and immediately adjoining said cutting blade, and means for applying a vacuum to said passage.

12. Apparatus for folding and trimming signatures cut from a continuously advancing strip comprising

7

first and second rotary cylinders having means thereon for cutting successive signatures from the advancing strip, a third rotary cylinder, means disposed on the peripheries of said second and third rotary cylinders for successively folding each cut signature at a predetermined distance from the leading edge thereof and move the leading half of the signature into overlying relationship with the trailing half, a fourth rotary cylinder, means disposed on the peripheries of said third and fourth rotary cylinders for trimming the trailing edges of each folded signature, vacuum means for removing the trimmed waste, and means for removing the trimmed signatures, means disposed on the periphery of said second rotary cylinder for gripping the leading edge of each cut signature, means for holding the trailing portion of the cut signature in close proximity to the peripheral surface of said second rotary cylinder, said holding means comprising at least one longitudinal shaft within and adjoining the surface of said second cylinder, a plurality of pins carried by said shaft, a cam follower assembly secured to said shaft, a cam cooperating with said cam follower assembly to move said pins to and from a position extending from the surface of the last said cylinder during rotation thereof, said folding means comprising at least one folding blade on said second rotary cylinder; a pair of relatively movable jaws on said third rotary cylinder, means for rotating said cylinders in synchronism whereby said blade tucks said signature between said jaws which clamp the folded edge of the signature and permit withdrawal of the blade, a fixedly mounted jaw operating cam spaced

8

from one end of said third rotary cylinder, cam follower means coupled to at least one of said jaws for moving it relative to the other jaw, said trimming means including at least one elongated anvil carried by said third rotary cylinder and movable to and from a position wherein the surface of said anvil is in approximately alignment with the surface of said cylinder, said fourth rotary cylinder including at least one cutting blade cooperating with said anvil to trim the trailing edge of the folded signature, a fixedly mounted anvil operating cam spaced from one end of said third rotary cylinder and cam follower means coupled with said anvil whereby said cam and cam follower operate to move said anvil to and from said position.

13. Apparatus according to claim 12 wherein said vacuum means includes a passage extending through said fourth rotary cylinder and at least one elongated channel extending from the surface of said fourth cylinder and communicating with said passage, said channel being disposed on the trailing side of and immediately adjoining said cutting blade, and means for applying a vacuum to said passage.

14. Apparatus according to claim 13 wherein said fourth rotary cylinder includes at least two diametrically opposed cutting blades, at least two of said channels with one channel adjoining each blade and means surrounding a portion of said fourth cylinder to restrict the flow of air into each of said channels during movement through a predetermined portion of their angular path.

\* \* \* \* \*

35

40

45

50

55

60

65