United States Patent

[11] **3,570,344**

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[45] Patented **Mar. 16, 1971**
[73] Assignee **Harris-Intertype Corporation**

[54] **APPARATUS AND METHOD FOR TRIMMING BOOKS**
21 Claims, 14 Drawing Figs.

[52] **U.S. Cl.** **83/155,** 83/26, 83/255, 83/268, 83/420, 83/422, 83/566, 83/925
[51] **Int. Cl.** **B65h 35/06**
[50] **Field of Search** ..... 83/26, 52, 203, 151, 155, 422, 566, 268, 422, 431, 567, 569, 925 (BT); 83/420, 255

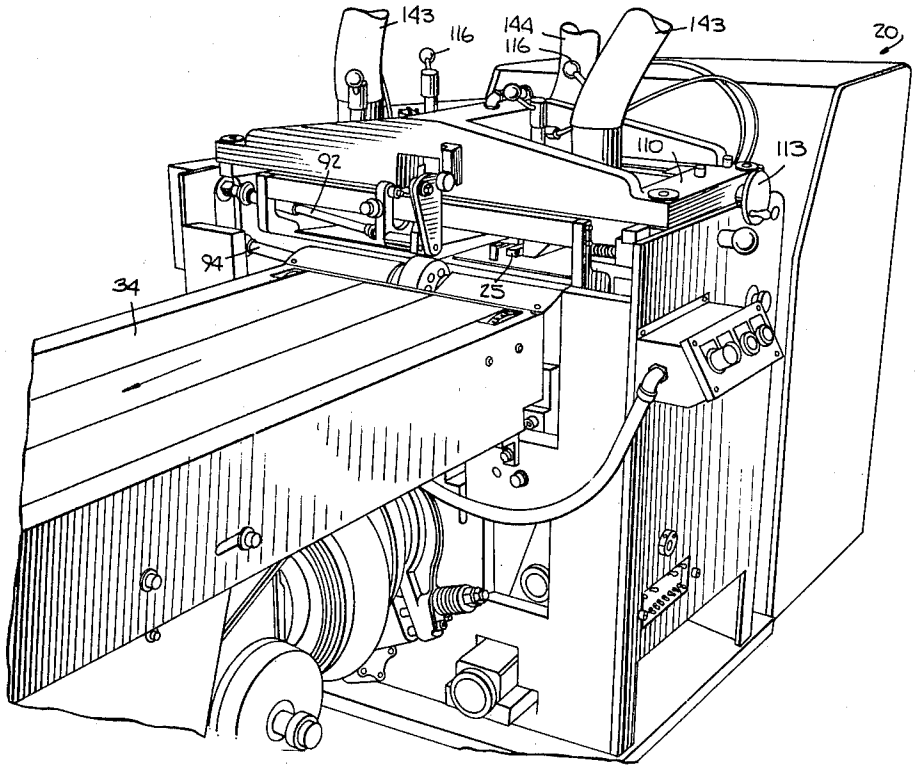
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ABSTRACT: The disclosure relates to an apparatus and a method for trimming books or magazines by placing them on a movable support having a resilient supporting surface. The support with a book in place thereon is elevated adjacent a plurality of fixed trimming knives in order that the knives can trim the book as it is pressed against the knives. The support is then lowered and the trimmed book is removed. As a result the vertically reciprocating support and the fixed knives enable books to be trimmed at a single station within the apparatus.



Patented March 16, 1971 **3,570,344**

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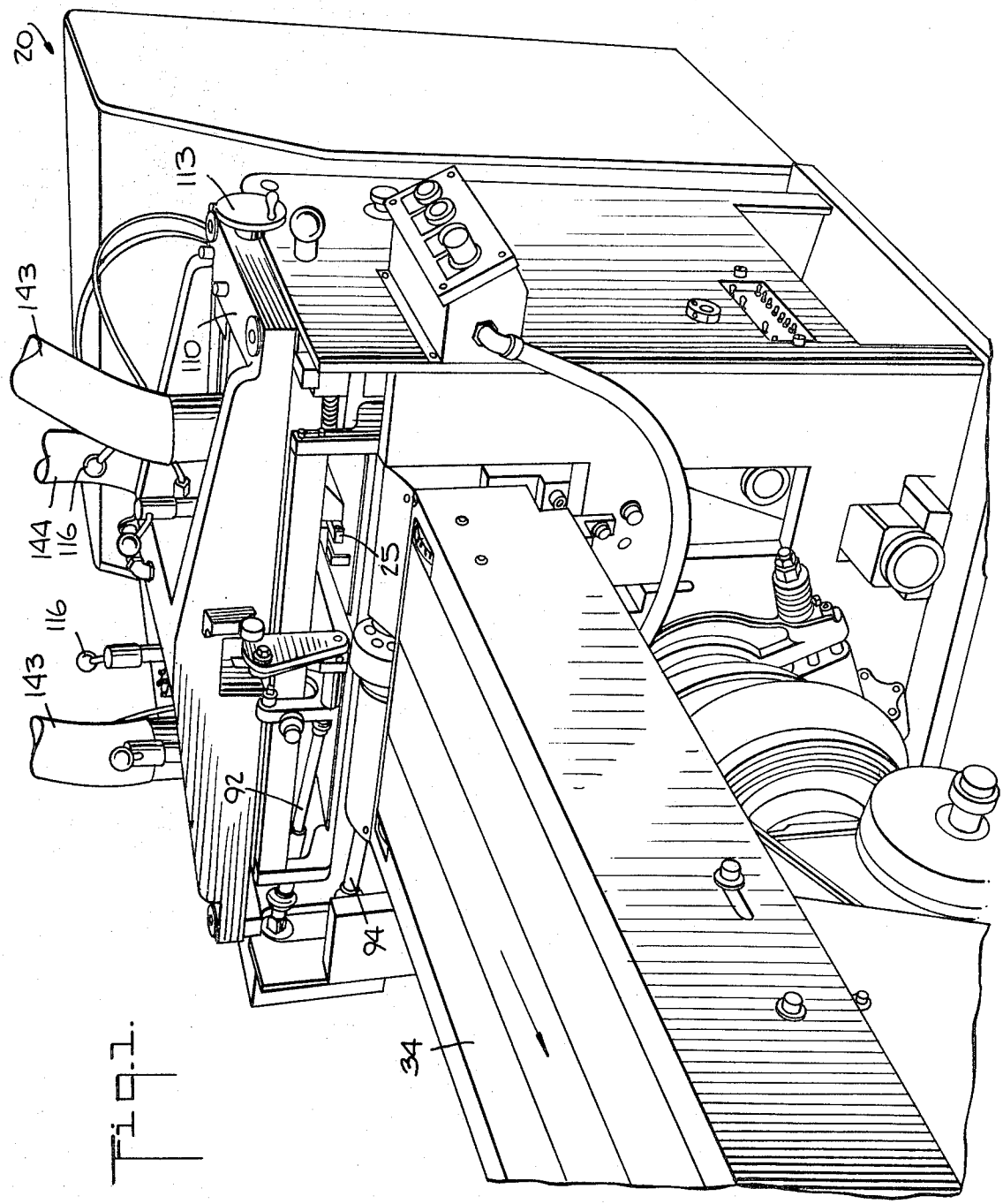


Fig. 1.

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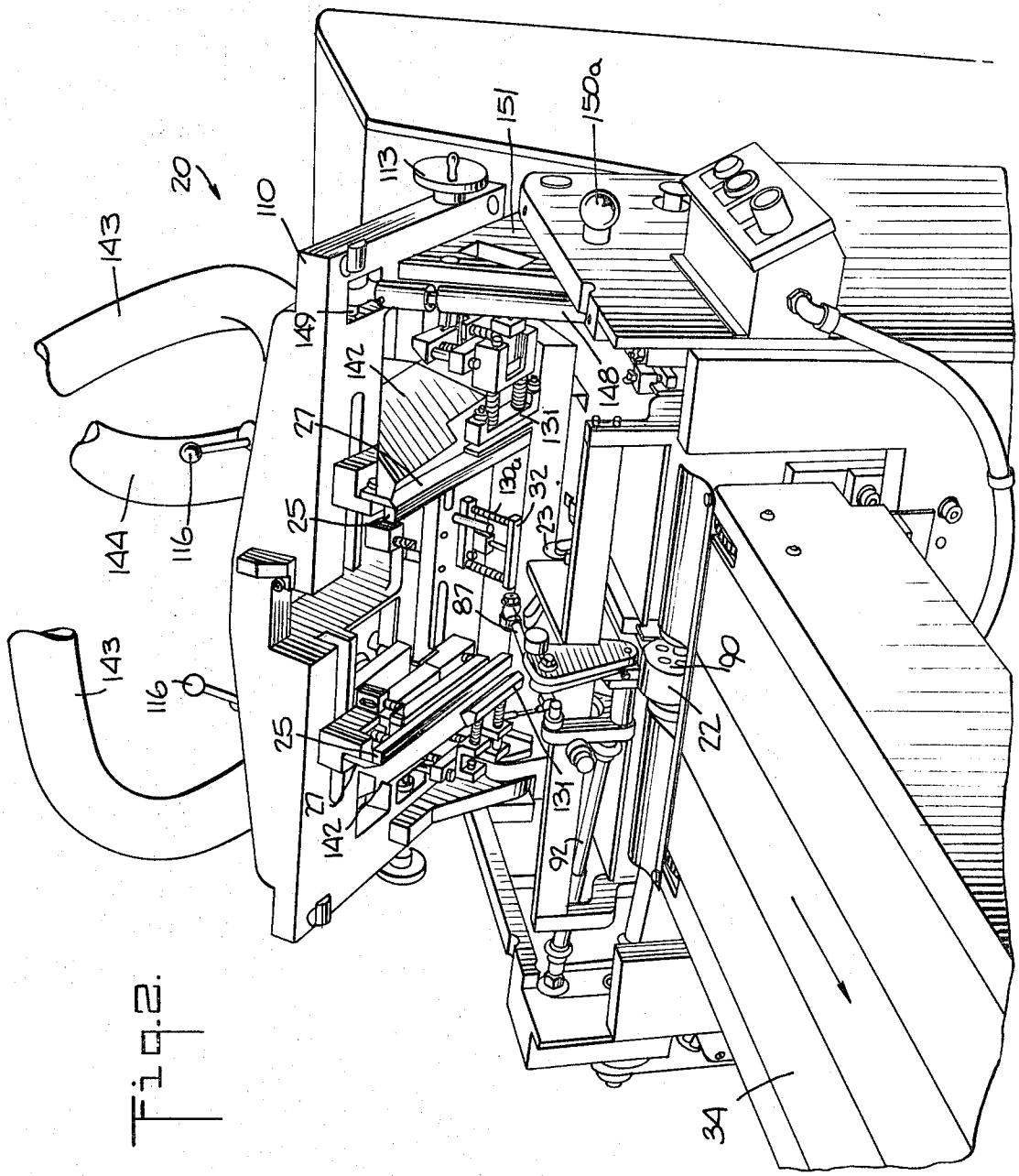


Fig. 2.

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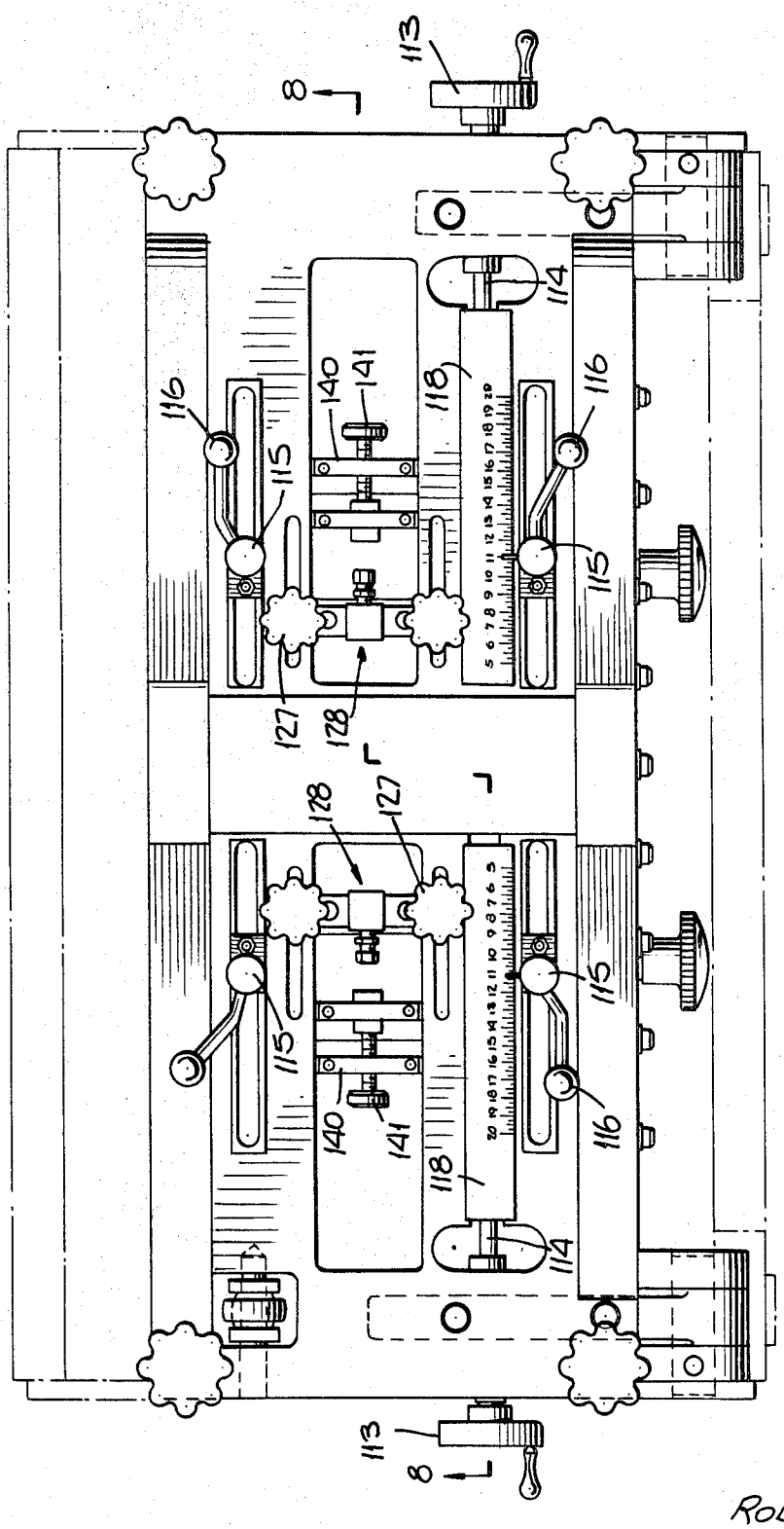


Fig. 3.

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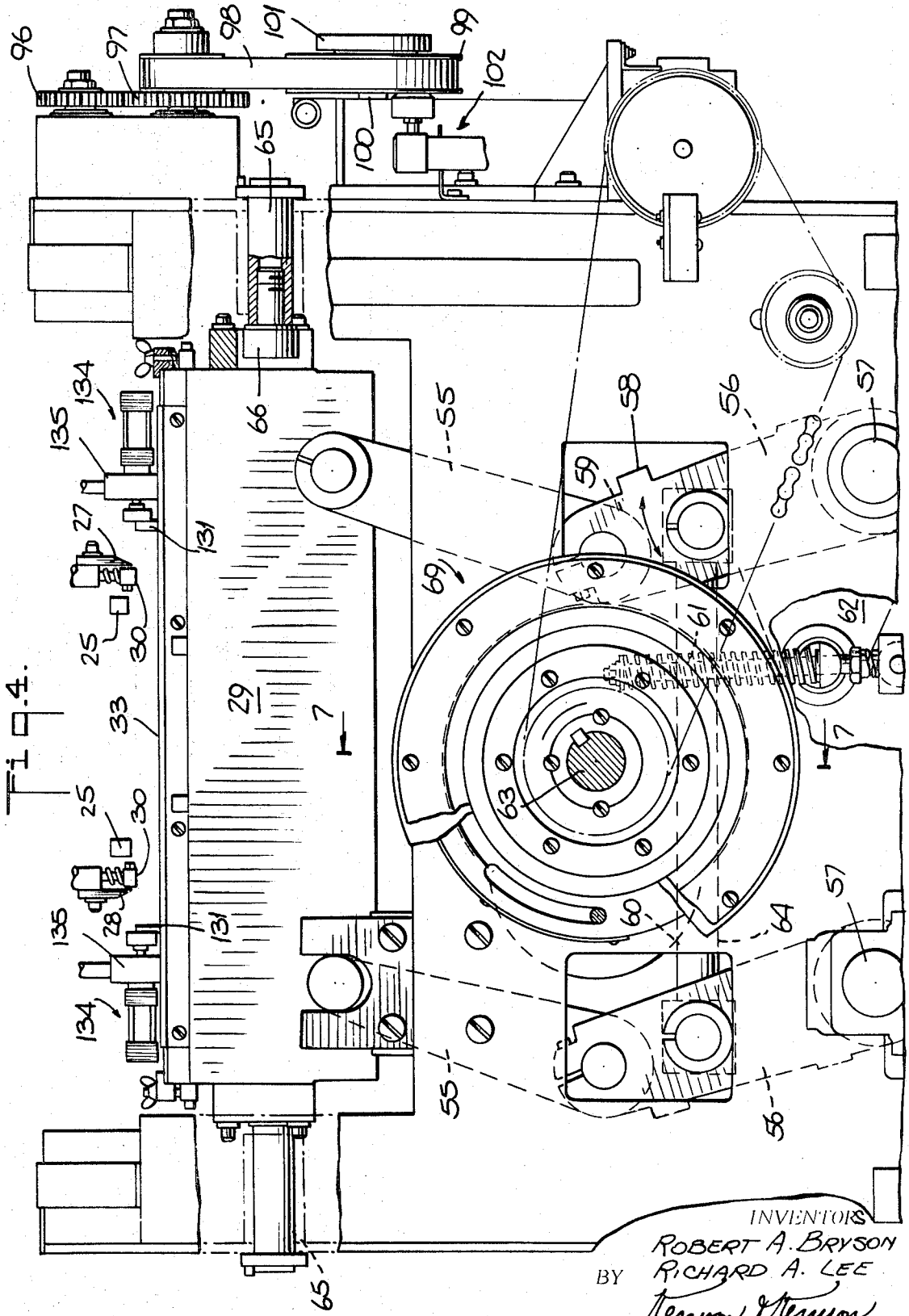
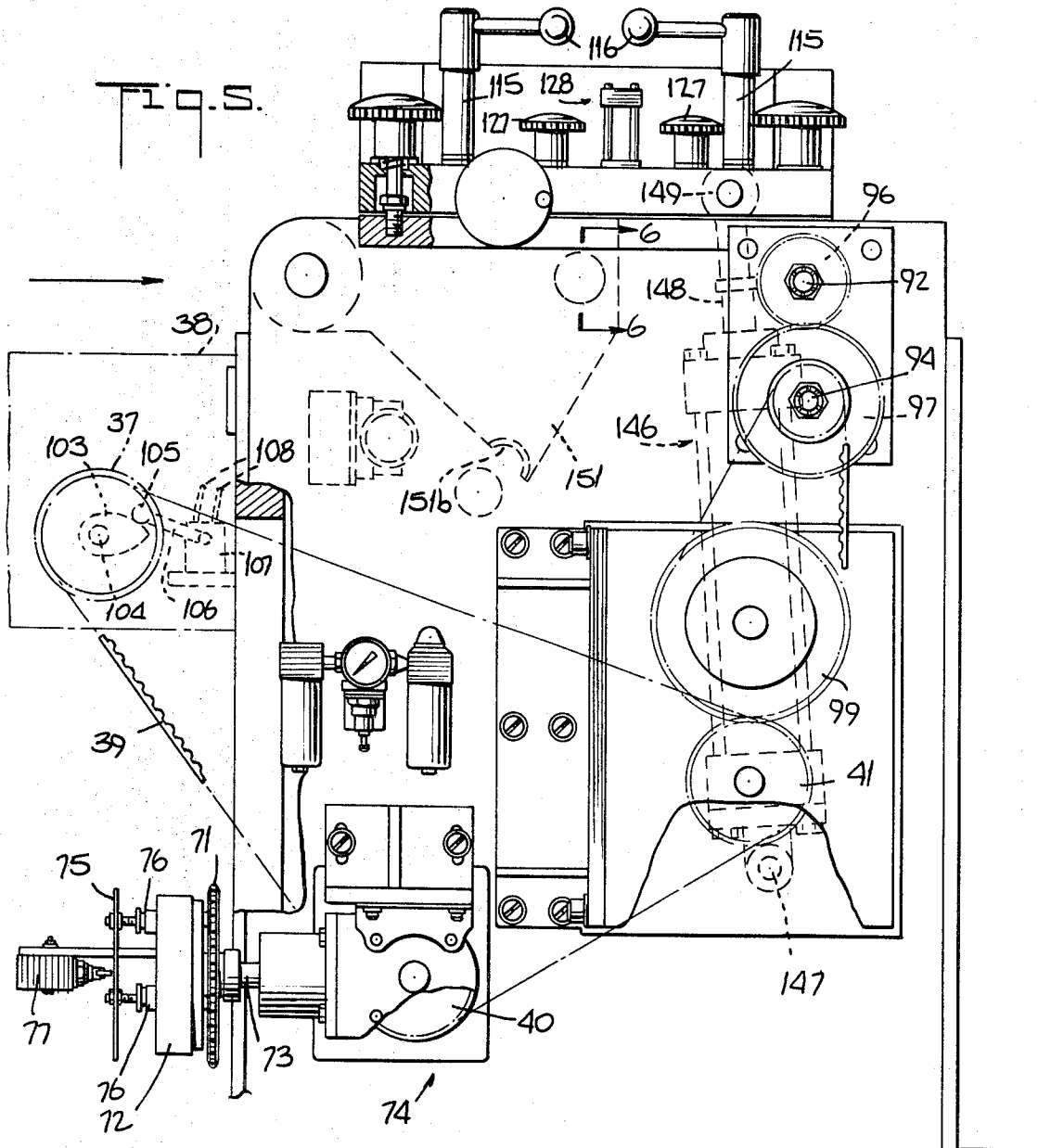


Fig. 4.

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Fig. 5.



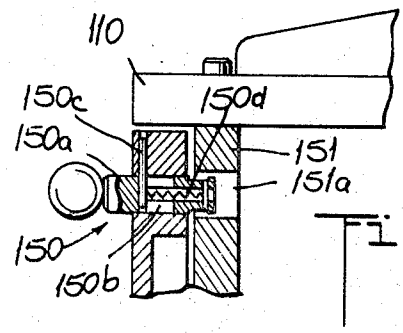


Fig. 6.

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Fig. 1B.

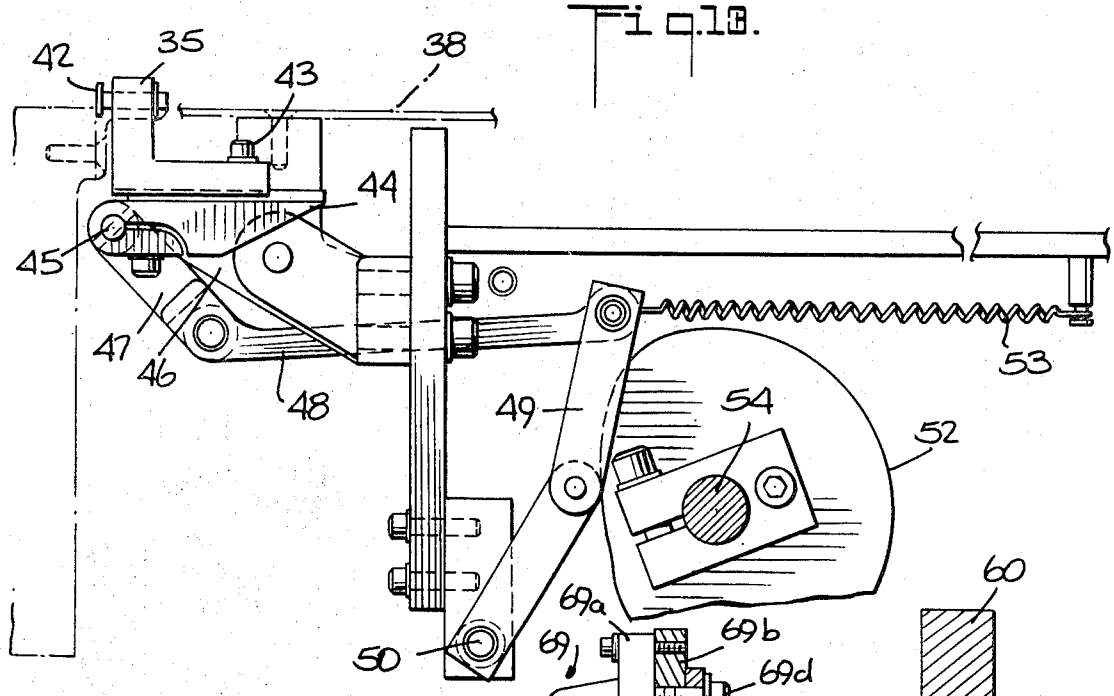


Fig. 1A.

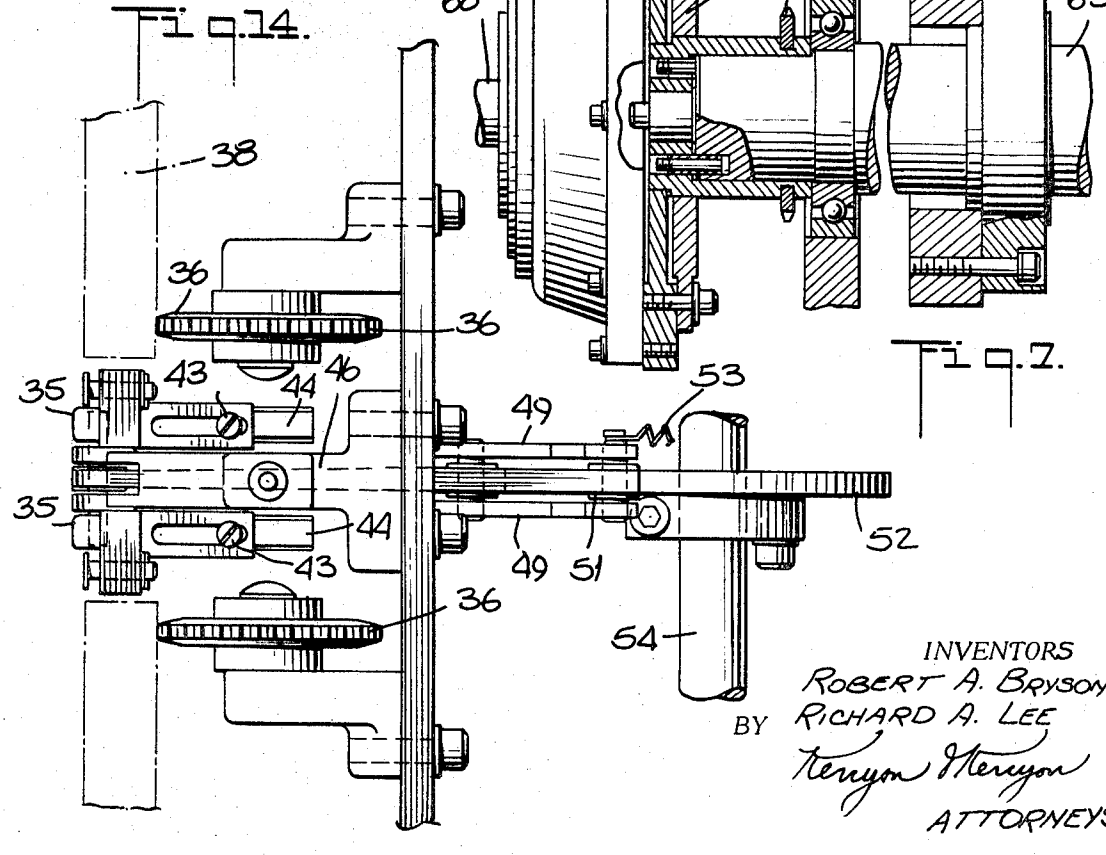


Fig. 7.

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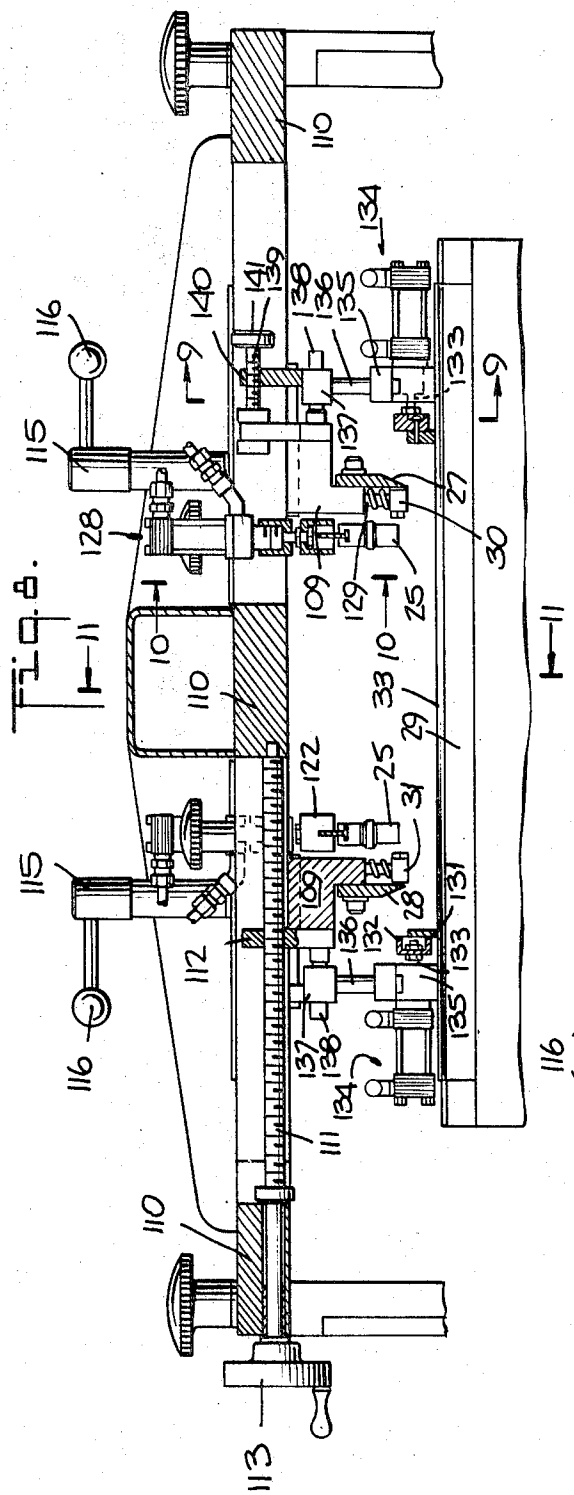


Fig. 8.

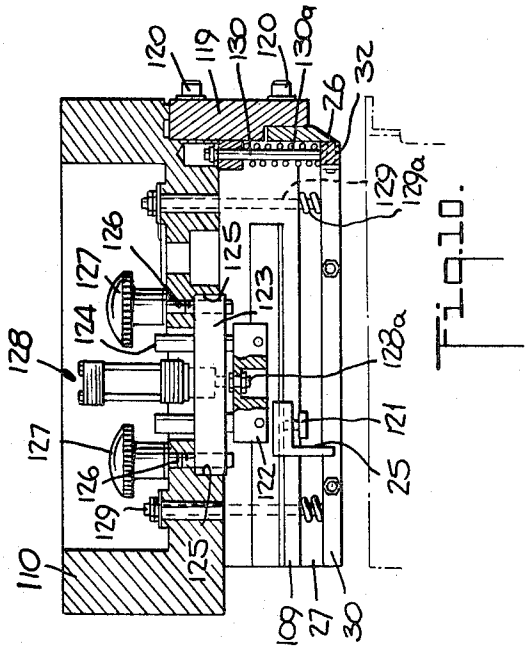


Fig. 10.

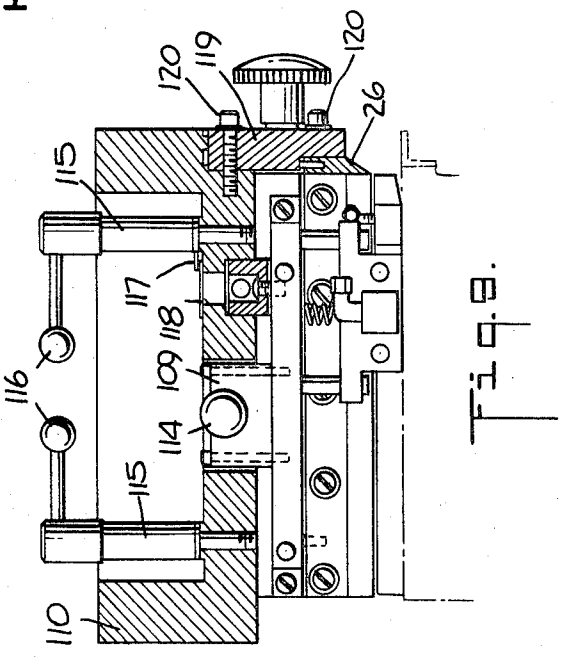


Fig. 9.

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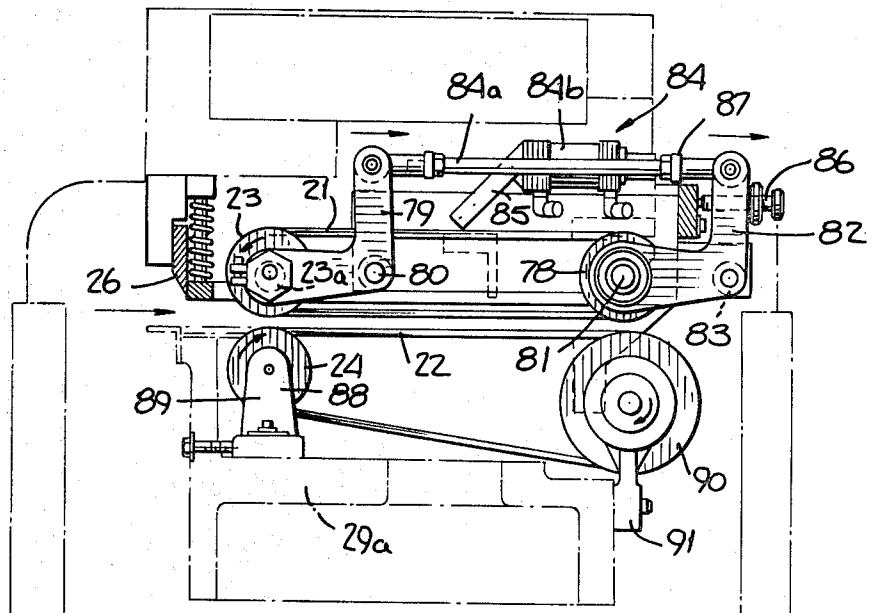
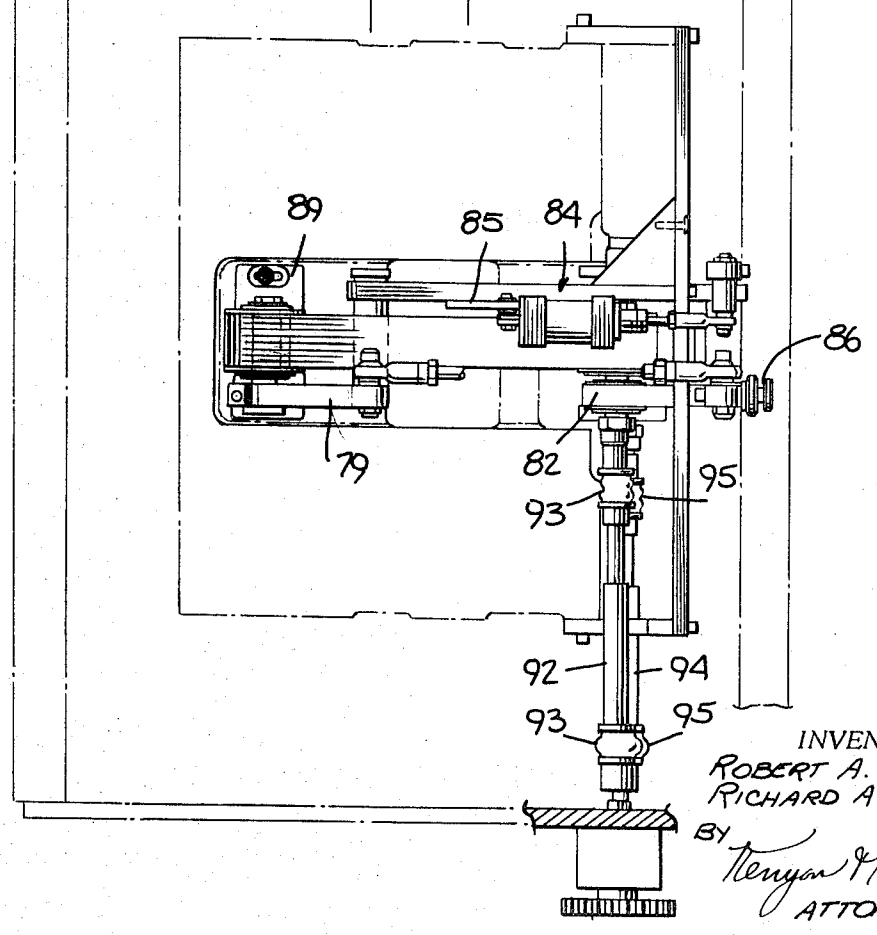


Fig. 11.

Fig. 12.



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APPARATUS AND METHOD FOR TRIMMING BOOKS

FIELD OF THE INVENTION

The invention pertains to the field of art which includes book-trimming machines and more specifically machines employing a plurality of knives at a single station and adapted to cut along a continuous cutting line such as a continuous U-shape cutting line. More in particular the invention pertains to the field of trimming machines in which the books are advanced onto a vertically reciprocating supporting table and are subsequently pressed against a plurality of stationary cutting knives.

DESCRIPTION OF THE PRIOR ART

In accordance with the prior art, trimming machines have been provided in which the trimming knives are moved and in which the supporting surface remains stationary. Machines having arrangements of cutting knives have been employed which are capable, for example, of simultaneously cutting the top and bottom edges of the books. In the prior art machines it is customary to move a book onto a stationary supporting surface and then to move the trimming knives into engagement with the book. Consequently, the structure of the machine which carries the trimming knives must be capable of being adjusted with respect to a reciprocating support in order to accommodate and trim various sizes and thicknesses of books.

SUMMARY

An infeed table having infeed chain lugs can be employed to advance a book into the trimmer of the invention. By means of a mechanical jogger and a plurality of resilient clips the incoming book is urged against an infeed side guide. The book is carried into the trimmer and toward backstops therein by upper and lower transport belts operating at a constant velocity until the books approach the backstops and then subsequently at a reduced velocity as the books hit the backstops. When the books are positioned beneath the trimming knives, mounted upon the upper stationary frame of the trimmer, the upper transport belt is lifted in order to permit the lower belts to move the book against the backstop. Clamps mounted on the upper frame clamp the book on the trimming table as the trimming table is raised to bring the book into contact with the knives. The front and side knives penetrate through the book until the knives engage the resilient surface of the trimming table. The table is then returned to its downward position, the backstops are withdrawn, the upper transport belt is lowered against the book, and the book is accelerated from the machine.

Since the trimming knives, the clamps, the backstops, and other components are mounted upon the stationary upper frame of the trimmer, they can be rigidly supported within the machine and yet be provided with a range of adjustments in order to accommodate various sizes and thicknesses of books. Thus the provision of a vertically reciprocating trimming table simplifies the construction of the machine since the table does not carry moving elements with the exception of the lower transport belt. In addition the inherent structural rigidity of the trimming table enable it to be reciprocated without undesirable deflection and distortion. An additional advantage of the reciprocating trimming table of the invention is that it enables the reciprocating mass to be positioned nearer to the drive and thereby reduce the structural requirements of the members which support and drive the trimming table.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view of the trimmer of the invention looking toward its discharge side;

FIG. 2 is a perspective view showing the upper frame of the machine which supports the trimming knives in an open tilted position for permitting service of the trimming knives of the other components mounted thereon;

FIG. 3 is a plan view of the machine of the invention showing manual adjustment provisions on the upper frame for the trimming knives, the backstops and the side joggers;

FIG. 4 is a fragmentary vertical section view of the entrance portion of the trimming tale showing the reciprocating drive thereto;

FIG. 5 is a side elevational view showing certain of the drives of the machine;

FIG. 6 is a fragmentary vertical section view taken along the line 6–6 in FIG. 5 and showing a safety lock for the upper frame of the machine when it is in the elevated position shown in FIG. 2;

FIG. 7 is a fragmentary vertical section view taken along the line 7–7 in FIG. 4 and showing timing adjustments on the drive to the machine for accommodating different front-to-back book sizes;

FIG. 8 is a fragmentary vertical section view taken along the line 8–8 in FIG. 3 and showing the mounting of the joggers, the side-trimming knives, the clamping mechanisms, and the backstops of the machine;

FIG. 9 is a fragmentary vertical section view taken along the line 9–9 in FIG. 8 and showing the construction and adjustment for a side jogger;

FIG. 10 is a fragmentary vertical section view taken along the line 10–10 of FIG. 8 and showing the adjustable positioning of one of the backstops;

FIG. 11 is a fragmentary vertical section view showing the transport conveyors;

FIG. 12 is a plan view showing the actuator for the upper transport assembly;

FIG. 13 is a fragmentary vertical section view showing a pusher assembly for advancing a book during delivery into the trimmer; and

FIG. 14 is a fragmentary vertical section view (rotated 90°in a counterclockwise direction as viewed in the drawing) of the pushers at the entrance to the trimmer, looking toward the entrance to the trimmer.

Machine 20 of the invention is adapted to perform trimming or other cutting operations upon books and magazines. When the machine is operated as a trimmer it is adapted to receive a book from the discharge section of a preceding machine such as a stitcher. Beyond the delivery section of the preceding machine the book is picked up by infeed chain lugs (not shown), such as those disposed along a plurality of chains, which pushes the book toward trimming machine or trimmer 20 (FIG. 5). Immediately after the book is picked up by the infeed chain lugs, the book is registered against an infeed side guide (not shown) which extends in a direction parallel to the path of travel of the book into the trimmer. A jogger (not shown) can be used to urge the incoming book against the infeed side guide. Once the book is registered against the side guide a plurality of spring pressure clips disposed in a line parallel and spaced apart from the infeed side guide can be provided to contact the tail of the book opposite the side guide and hold it in register against the side guide. At this point the book is ready to enter the entrance portion of the trimmer. Consequently at the entrance to the trimmer the infeed chain lugs drop down and disengage from the front edge of the book as the book is advanced into the trimmer.

The timing of the infeed chain lugs with respect to the trimmer is adjustable in order to insure that the incoming book is pushed into engagement with belts 21 and 22 (FIG. 11) which extend about transport belt pulleys 23 and 24, respectively. In adjusting the point at which the infeed chain lugs drop and disengage from the book, care must be taken that the lugs drop as soon as the book enters the transport belts 21 and 22 so that the book is not compressed or buckled between the infeed chain lugs and the transport belts.

Once the book has been advanced between belts 21 and 22 (FIG. 11) the belts convey the book to the right as viewed in FIG. 11 at a constant velocity, the velocity which can be selected to be slightly faster than the velocity of the book while it is being advanced toward the trimmer on the infeed ta-

ble. Subsequently transport belts 21 and 22 decelerate the book so that the book is at a reduced velocity when the folded or binding edge of the book reaches backstops 25 FIGS. 4 and 8 and 10). Transport belts 21 and 22 are driven by an index unit such as a clutch which gives the controlled acceleration and deceleration of the book as is discussed subsequently herein. When the book is nearly stopped beneath front edge trim knife 26 (FIGS. 9, 10 and 11) and side-trimming knives 27 and 28 upper transport belt 21 is lifted to disengage the drive of the conveyor to the book.

In order to perform the trimming operations related to the side edges and the front edge of the book, bed or table 29 is elevated toward the trimming knives 26 and 27 (FIG. 8). As the table moves upwardly, the upper surface of the book is brought into engagement with side clamps 30 and 31 (FIG. 8) and front clamp 32 (FIG. 10). The clamps serve to hold the book in its registered position on table 29 during the trimming operation. After the trimming knives have completely cut through the book, the cutting edges of the knives abut against pad 33 of resilient material which covers the top surface of the table. By way of example, the pad can be formed of nylon, urethane, or some other polyamide material or an elastomeric material, etc. With this arrangement, the book is pressed past the cutting edges of the knives until the cutting edges enter slightly into the upper surface of pad 33. This arrangement insures that the book is completely trimmed along its side and front edges during a single trimming operation.

After the trimming operation has pulleys disposed completed, table 29 one lowered adjacent to the 25 are retracted vertically in order to free the binding edge of the book for delivery said pulleys;

h. the trimming machine. Following the retracting of the backstops, upper transport belt 21 is lowered into engagement is placed from said book means and by means displaced from belts 21 and when said the book is accelerated out of the trimmer.

To insure that a book delivered onto table 29 does not bounce away from backstops 25 and lose its registry, a pair of pushers 35 (FIG. 13) can be mounted adjacent to the junction between the infeed table and the entrance portion of the trimmer. In this way the folded edge of the book is positively held against the backstops prior to the engagement of the front and side clamps.

The infeed chains bearing lugs which advance a book into the trimmer of the invention pass over idler sprockets 36 (FIG. 14). Gear 37 (FIG. 5) disposed beneath infeed table 38 transmits the drive to the infeed chains from the trimmer. In turn gear 37 is driven by gear belt 39 which passes over gears 40 and 41.

When a book is advanced by the transport belts against backstops 25, the book is initially advanced slightly faster than the velocity of the lugs of the infeed chain. Subsequently, the transport belts decelerate the movement of the book prior to its contact with the backstops. Under certain circumstances, it is possible for the book to bounce away from the backstops after initially contacting them and this condition can result in a failure of the book to be properly registered with respect to the trimming knives. In order to prevent the possibility of the book bouncing away from the backstops, pushers 35 are elevated into contact with the book after it has passed over the location of the pushers. As result, pads 42, adjustably mounted by a threaded connection in pushers 35, engage the front edge of the book. Pushers 35 are adjustably mounted by screws 43 upon support 44 which is rotatably mounted about shaft 45 extending through bracket 46 (FIGS. 13 and 14). Support 44 is rotated between the elevated position of pushers 35 shown in FIG. 13 to a retracted position, that is, a position displaced approximately 45° in a clockwise direction as viewed in FIG. 13 by lever 47 which is pivotally connected to link 48. Crank 49 which is rotatably mounted about shaft 50, is pivotally connected to the free end thereof to link 48. The crank carries roller follower 51 which is urged into engagement with the periphery of cam 52 by spring 53. Rotation of shaft 54 in a predetermined phase relationship with the infeed chain causes crank 49 to be oscillated and thereby causes pushers 35 to be cyclically elevated to push a book and retracted to accommodate the passage of the next book.

As shown in FIG. 4, table 29 is driven with a vertically reciprocating motion through a stroke by way of example of approximately seven-eighths of an inch, by a form of toggle linking. Four links 55 are pivotally connected to the table 29. In turn, links 55 are each connected to lower links 56 which are rotatably mounted with respect to the frame of the machine about shafts 57. Between lower links 56 and attached thereto is disposed crank 58 which carries roller follower 59 in contact with the outer periphery of drive cam 60. Spring 61 biases arm 62 connected to crank 58 in order to bias the roller follower into engagement with the cam.

Cam 60 is driven in rotation by main shaft 63. The engagement of follower 59 with cam causes crank 58 to be oscillated and thereby links 56 attached thereto. The oscillating motion of links 56 adjacent to crank 58 is transmitted to the remaining pair of links 56 by means of connecting rod 64 which is pivotally connected to a pair of the lower links 56. As a result the oscillations of the pairs of lower links 56 are in phase with one another and cause a corresponding oscillation of links 55 which impart a vertically reciprocating motion to table 29. The frame of the machine is provided with stub shafts 65, each of which is provided with a bearing 66 which engages vertical slideways 67 in table 29. In this way the guideways and thereby the table is confined with respect to a vertical plane extending through the central axes of each of the stub shafts.

The drive to shaft 63 is derived from shaft 68 which is connected to the drive of the stitcher. The stitcher precedes the trimmer of the invention in in the direction of the line of flow of the books (FIG. 7). Coupling 69 which connects shaft 68 to main shaft 63 is circumferentially adjustable in order to enable the phase between the two shafts to be varied. Flange 69*a* is fixed with respect to shaft 68. Flange 69*b* is fixed with respect to shaft 63. The two flanges are clamped with respect to one another and thereby clutched together by means of pressure plate 69*c* and screws 69*d*. Thus upon loosening screws 69*d*, flange 69*b* can be moved with respect to flange 69*a* in order to adjust the phasing between shafts 63 and 68. The changing of the relative positions between the shafts changes the timing of the trimmer with respect to the infeed chain so that accommodation can be made for differences in the front to back (folded or binding edge to front edge) of the books to be trimmed.

Sprocket 70 mounted upon shaft 63 transmits a drive to sprocket 71 (FIG. 5). Hub 72 is attached to shaft 73 which drives angle gearbox 74. By means of disc 75 and pins 76 attached thereto, the pins can be advanced through openings in hub 72 and into corresponding openings in sprocket 71 in order to selectively clutch the sprocket to shaft 73. Switch 77 senses the position of disc 75 and thereby the condition of the clutching action between hub 72 and sprocket 71.

As shown in FIG. 11 upper transport belt extends about idler pulley 23 and driven pulley 78. Shaft 23*a* of the idler pulley is mounted on one arm of bellcrank 79 which is pivotally mounted about shaft 80 with respect to the frame of the machine. In a similar manner, driven pulley 78 is supported by shaft 81 mounted in one arm of bellcrank 82 which is pivotally mounted with respect to the frame of the machine by shaft 83. The arms of bellcranks 79 and 82 opposite the arms supporting the pulleys are pivotally connected to piston rod 84*a* of actuator 84 which can be operated by fluid pressure. Housing 84*b* of the actuator is fixed with respect to the frame of the machine by link 85. Consequently upon applying fluid pressure to the piston of actuator 84 (piston not shown), piston rod 84*a* can be reciprocated with respect to the frame of the machine. When the piston rod is moved to the right as viewed in FIG. 11 the bellcranks are rotated in a clockwise direction thereby raising the pulleys and transport belt 21 with respect to the path of travel of the book represented by the arrow in the drawing.

Screw 86 which is threadedly engaged with the upper arm of the bellcrank 82 has an end portion bearing upon block 87. The adjustment of screw 86 determines the extreme counterclockwise motion and thereby the position which the bellcrank 82 can assume and in turn bellcrank 79. Consequently the screw determines the lowermost position of transport belt 21 and in this way the upper transport belt 21 is adjusted for the thickness of the book to be trimmed.

Lower belt 22 passes about idler pulley 24 which is supported by shaft 88 and trunnions 89 with respect to internal frame members 29*a*. Pulley 90 is supported by trunnion 91 with respect to frame member 29*a*. The drive to pulley 78 is provided by telescoping shaft 92 including universal joints 93. The drive to pulley 90 is provided by telescoping shaft 94 including universal joints 95 (FIG. 12). As shown in FIG. 5 shaft 92 is driven by gear 96 which is meshed with gear 97 connected to shaft 94. In turn gear 97 is driven by gear belt 98 which extends about gear 99.

Gear 99 is coupled to shaft 100 by an index unit 101 (FIG. 4). Clutch 101 is cyclically engaged to drive gear 99 whenever the transport belts are driven in order to advance a book into the trimmer of the invention and to discharge a book after the trimming operation has been completed. The control of the clutch can be provided by relay 102 which can be actuated by fluid pressure.

The control of index unit 101, actuator 84, and other components of the trimmer can be provided by a plurality of cams 103 mounted upon shaft 104 to which is attached sprocket 37 (FIG. 5). As discussed above the drive to the infeed chains is provided by the trimmer through belt 39 and sprocket 37. The plurality of cams 103 are each provided with roller follower 105 mounted upon arm 106 which is connected to the shaft of one of the plurality of control devices 107. Where a fluid pressure device, such as actuator 84 is to be used, control device 107 can be an air valve operated by arm 106. Thus pneumatic lines 108 can connect an air valve to an actuator such as actuator 84. In place of air valves and pneumatic actuators, control devices 107 can comprise mechanical actuating control devices which are coupled by push-pull cables to actuating devices to be cyclically controlled such as actuator 84 and index unit or index unit 101.

It should be noted that the drive of shaft 104 to the infeed chains of infeed table 38 can be coupled through a device which enables the phase of the infeed chains to be varied with respect to the phase of shaft 104. For example, a differential gear mechanism can be employed for the phase adjustment.

As shown in FIG. 8 each of side knives 27 and 28 is provided with an adjustable support 109. Supports 109 are slidably mounted with respect to upper frame 110. Screw shaft 111 is threadably engaged to nut 112 attached to support 109. By rotation of crank 113, screw shaft 111 adjustably positions the side knife in transverse direction with respect to the path of a book through the machine. The transverse adjustment provision shown at the left-hand side of FIG. 8 is also provided for adjusting side knife 27.

As shown in FIG. 9 support 109 is slidably mounted with respect to upper frame 110 by means of support shaft 114. Thread locks 115 are loosened prior to adjustment of a side knife in order to enable support 109 to be moved with respect to upper frame 110. After adjustment the screw lock is tightened in order to prevent change of the adjustment during operation of the trimmer. Handles 116 enable the screw locks to be manually operated.

As shown in FIGS. 3 and 9, pointer 117 is mounted adjacent to the screw lock. Scale 118 enables the position of a side knife to be indicated. As a result the position of each of the side knives can be accurately set each time a book having a different head-to-tail book size is to passed through the trimmer of the invention. Front knife 26 is clamped by means of plate 119 which is attached to upper frame 110 by screws 120 (FIGS. 9 and 10).

Each of the backstops 125 is mounted by screw 121 to support 122 (FIGS. 8 and 10). Support 122 is guided for vertical adjustment with respect to guideplate 123 by means of pins 124 which are slidably engaged with openings extending through the guideplate. Guideplate 123 is adjustably mounted with respect to slot 125 of support 110 and is locked in an adjusted position by means of lock screws 126 to which are attached handles 127.

Backstops 25 are lowered to their operative position prior to the advance of a book into the trimmer by the transport belts. After a trimming operation is completed the backstops are elevated in order to permit the discharge of the trimmed book. Actuator 128 connected to support 122 by shaft 128*a* cyclically raises and lowers the support and thereby the backstop. Actuators 128 can be operated by fluid pressure. In such a case control devices 107 (FIG. 5) operated by cams 103 determine the cyclical reciprocating motion imparted to the backstops. Again as in the case of actuator 84, actuator 128 (FIG. 8) can be mechanically operated such as for example, by means of a push-pull cable.

As shown in FIGS. 8 and 10, side clamps 30 are resiliently supported with respect to upper frame 110 by means of pins 129 and springs 129*a*. With this construction the clamps can maintain a uniform clamping force upon the book adjacent to the trimming operation being performed by the side knives at the head and tail portions of the book. In a similar manner front clamp 32 is resiliently supported with respect to upper frame 110 by means of pin 130 and spring 130*a* (FIG. 10).

Once a book has been advanced onto trimming table 29 and against backstops 25 it is necessary to insure that the head and tail portions of the book are in proper register with respect to side-trimming knives 27 and 28. To insure that proper registry is obtained the trimmer of the invention is provided with side joggers 131 (FIG. 8). Each of the joggers is clamped to support 132 which is attached to shaft 133. Shaft 133 is positioned in a reciprocating manner by actuator 134. The actuator is mounted upon block 135 which is connected to pins 136. Supports 137 are slidably mounted upon studs 138 by means of screw shaft 139 which extend through nut 140 connected to support 137. In this way support 137 and thereby actuator 134 can be adjustably positioned in a transverse direction with respect to the path of flow of the books. Knob 141 enables screw shaft 139 to be manually operated. Thus by adjusting the position of actuator 134, the position of jogger 131 can be adjusted for the trim size of a given book.

Actuators 134 can be operated by fluid pressure from control devices 107 mounted adjacent to cam 103 (FIG. 5). In the alternative, control devices 107 can transmit mechanical motion to actuators 134 by means of mechanical drives such as push-pull cables. In operation actuator 134 advances jogger 131 toward and into engagement with a side edge of the book when the book is positioned beneath the side-trimming knives. After the trimming operation has been completed jogger 131 is retracted as the book is discharged from the trimmer.

As shown in FIG. 2 chip chutes 142 are mounted adjacent to each of the side-trimming knives. The application of suction to ducts 143 enables the chips or trimmings resulting from the side-edge-trimming operations to be continually removed from the machine. In a similar manner duct 144 is provided to remove chips formed by the front edge knife.

During the preparation of the trimmer of the invention for a run of trimming operations or subsequent to a run of trimming operations, it may be necessary to service the trimming knives. In addition it may be necessary to service other components of the trimmer such as the upper and lower transport belts and drives, the front or side clamps, the side joggers, etc. To facilitate service operations the upper frame 110 of the machine is pivotally supported about shafts 145 (FIG. 5).

In order to move the upper frame to its elevated position such as shown in FIG. 2, there is provided actuator 146 (FIG. 5). The base of the actuator is pivotally mounted with respect to the frame of the machine by means of shaft 147. The actuator can be operated by fluid pressure. In such a case the piston (not shown) of the actuator is connected to piston rod 148 which has its free end pivotally connected by shaft 149 to the upper frame.

In order to insure that the upper frame is raised and lowered in a safe manner there is provided safety lock **150** (FIG. 6). The safety lock includes pin **150***a* which contains slot **150***b* through which dowel **150***c*, when mounted upon the frame of the machine, extends. Spring **150***d* maintains the pin in a position extended into opening **151***a* of plate **151** attached to upper frame **110**. Pin **150***a* is mechanically locked by means (not shown) which can be actuated in response to the application of fluid pressure to actuator **146** in order to interlock the safety lock to the actuator. As a result pin **150***a* can not be withdrawn from opening **151***a* until fluid pressure is applied to the actuator. When the upper frame has been elevated to the position shown in FIG. 2, pin **150***a* extends beneath cutout **151***b* in plate **151**. As a result pin **150***a* provides a mechanical interference with cutout **151***b* after the upper frame has been elevated and thus prevents accidental lowering of the upper frame. In order to withdraw pin **150***a* from its position in which it prevents downward movement of plate **151**, it is necessary to overcome the interlock by applying fluid pressure to actuator **146** before pin **150***a* can be withdrawn.

OPERATION

The magazine or book to be trimmed is advanced toward the trimmer by means of infeed chain lugs (not shown) extending adjacent to the upper surface of infeed table **38** (FIG. 5). In a typical example the book is delivered by the infeed chains from a stitcher to the trimmer. In such a case shaft **68** (FIG. 7) which is connected to the drive of the stitcher and is connected to main shaft **63** of the trimmer enables the trimmer to be driven in a predetermined phase relationship with respect to the stitcher. Coupling **69**, since it can be adjusted in a circumferential manner, enables the drive to the main shaft of the trimmer to be properly timed to the stitcher in accordance with the front edge to the binding or folded edge of the book to be trimmed.

Shaft **104** driven by gear belt **39** from the trimmer transmits the drive to the infeed chains. The timing of the infeed chains to the trimmer in response to the front edge of the folded edge of the book to be trimmed can be adjusted by the provision of a differential drive mechanism between shaft **104** and the drive to the infeed chains.

As the lugs of the infeed chain approach idler sprockets **36** (FIG. 14) adjacent to the in portion of infeed table **38**, the folded edge of the book is urged between transport belts **21** and **22** (FIG. 11). After the infeed chain lugs have passed over idler sprocket **36** (FIG. 14) the lugs drop below infeed table **38** and no longer engage the front edge of the book.

The transport belts advance the book toward backstops **25** (FIG. 8) which ultimately stop the advance of the book with the proper registry of the front edge of the book with the front knife. The transport belts which are driven by shafts **92** and **94** (FIG. 12) begin to decelerate in response to the disengagement of index unit **101** as the infeed lugs drop beneath the infeed table.

The transport belts convey the book toward backstops **25** initially at a constant velocity which is slightly faster than the velocity of the book on the infeed table. The subsequent deceleration of the belts in response to the index unit **101** (FIG. 4) reduces the velocity of the book as it hits the backstops. At this point pushers **35** are elevated into the position shown in FIG. 13 in order to contact the front edge of the book and prevent it from bouncing in a backward direction as the folded edge of the book hits the backstops.

When the book is nearly stopped under the trimming knives, upper transport belt **21** (FIG. 11) is lifted by actuator **84**. Approximately at the time the book strikes backstops **25** (FIG. 8), joggers **131** operated by actuators **134** jog the book into position under the trimming knives. The transport belts travel a short distance after the book hits the backstops in order to relocate the book against the backstops if joggers **131** should tend to cock the book.

After the book is brought to rest on trimming table **29** (FIG. 4) a toggle mechanism driven by cam **60** on main shaft **63** raises the table which is covered by resilient pad **33**. As the table rises, side clamps **30** FIG. 8 and front clamp **32** (FIG. 10), located adjacent to their respective trimming knives, press the book firmly against the table. As the table continues to move upwardly the trimming knives penetrate the book and thereby perform the trimming operation. At the conclusion of the trimming operation the blades contact and deflect resilient pad **33**.

As the toggle mechanism lowers table **29**, backstops **25** are retracted upwardly (FIG. 8) and the upper transport belt is lowered by actuator **84** (FIG. 11). Movement of transport belts **21** and **22** then accelerates the book out of the trimmer and on to delivery conveyor **34** (FIG. 1).

We claim:

1. A machine for performing a cutting operation upon a book comprising:

a. a cutting table;

b. means for advancing a book cyclically onto and off of said cutting table along a predetermined path of travel extending with respect thereto; said means comprising a lower conveyor extending adjacent to said cutting table and substantially parallel to said predetermined path of travel; and an upper conveyor mounted with respect to said support member and spaced from and substantially overlying said lower conveyor in a facing relationship therewith, said lower conveyor and said upper conveyor being adapted to engage a book therebetween to advance the book with respect to said cutting table along the predetermined path of travel;

c. support member overlying and spaced apart from said cutting table, said support member being mounted in a normally stationary position with respect to said machine;

d. means mounted on said support member in an overlying and facing relationship with respect to said cutting table for cutting a book disposed thereon;

e. means for reciprocating said cutting table between a position adjacent to said cutting means and an additional position displaced therefrom, said cutting table upon approaching said adjacent position being adapted to urge a book disposed thereon against said cutting means to perform a cutting operation; and

f. means mounted upon said cutting table for supporting said lower conveyor with respect thereto.

2. A machine for performing a cutting operation upon a book comprising:

a. a cutting table;

b. means for advancing a book cyclically onto and off of said cutting table along a predetermined path of travel extending with respect thereto; said means comprising a lower conveyor extending adjacent to said cutting table and substantially parallel to said predetermined path of travel; and an upper conveyor mounted with respect to said support member and spaced from and substantially overlying said lower conveyor in facing relationship therewith, said lower conveyor and said upper conveyor being adapted to engage a book therebetween and to advance the book with respect to said cutting table along the predetermined path of travel, said lower conveyor and said upper conveyor each comprising an endless element extending substantially parallel to one another and spaced apart from one another a distance substantially equal to the thickness of the book to be advanced;

c. a support member overlying and spaced apart from said cutting table, said support member being mounted in a normally stationary position with respect to said machine;

d. means mounted on said support member in an overlying and facing relationship with respect to said cutting table for cutting a book disposed thereon;

e. means for reciprocating said cutting table between a position adjacent to said cutting means and an additional position displaced therefrom, said cutting table upon approaching said adjacent position being adapted to urge a book disposed thereon against said cutting means to perform a cutting operation;

f. a pair of pulleys disposed spaced apart from one another adjacent to the opposite ends of said endless element;
g. means for applying a driving force to one of said pulleys;
h. means for reciprocating said upper conveyor between a position adjacent to said lower conveyor when said cutting table is placed from said cutting means and a position displaced from said lower conveyor when said cutting table is in a position adjacent to said cutting means; and
i. means for cyclically connecting a power source to said driving means for cyclically operating said upper conveyor when a book is to be advanced with respect to said cutting table, said means comprising an index unit and means for cyclically engaging said index unit to said upper conveyor.

3. A machine for performing a cutting operation upon a book in accordance with claim 1 in which said lower conveyor and said upper conveyor each comprise an endless element extending substantially parallel to one another and spaced apart from one another at a distance substantially equal to the thickness of the book to be advanced.

4. A machine for performing a cutting operation upon a book in accordance with claim 1 and further comprising means mounted on said support member for reciprocating said upper conveyor between a position adjacent to said lower conveyor when said cutting table is displaced from said cutting means and a position displaced from said lower conveyor when said cutting table is in a position adjacent to said cutting means.

5. A machine for performing a cutting operation upon a book in accordance with claim 3 and further comprising:
a. a pair of pulleys disposed spaced apart from one another adjacent to the opposite ends of said endless element;
b. means for applying a driving force to one of said pulleys; and
c. means for reciprocating said upper conveyor between a position adjacent to said lower conveyor when said cutting table is displaced from said cutting means and position displaced from said lower conveyor when said cutting table is in a position adjacent to said cutting means.

6. A machine for performing a cutting operation upon a book in accordance with claim 5 and further comprising means for cyclically connecting a power source to said driving means for cyclically operating said upper conveyor when a book is to be advanced with respect to said cutting table.

7. A machine for performing a cutting operation upon a book in accordance with claim 1 in which said means for cutting a book disposed upon said cutting table comprises at least one cutting knife having the cutting edge thereof extending substantially parallel to said cutting table and in a facing relationship therewith.

8. A machine for performing a cutting operation upon a book in accordance with claim 7 in which said means for cutting a book disposed upon said cutting table comprises:
a. a pair of side-trimming knives having the cutting edges thereof spaced apart from one another and substantially parallel and in a facing relationship with said cutting table; and
b. a front-trimming knife having the cutting edge thereof extending substantially at an to the end portion of each of each of said side-trimming knives disposed adjacent to the entrance to said cutting table and extending substantially parallel and in a facing relationship with said cutting table.

9. A machine for performing a cutting operation upon a book in accordance with claim 7 and further comprising:
a. a clamp member and
b. means for resiliently supporting said clamp member with respect to said support member adjacent to the cutting edge of said cutting knife for applying clamping pressure to a book disposed upon said cutting table when said cutting table is reciprocated toward said cutting knife.

10. A machine for performing a cutting operation upon a book in accordance with claim 1 in which said means for cutting a book disposed upon said cutting table comprises:
a. a pair of side-trimming knives having the cutting edges thereof spaced apart from one another and substantially parallel and in a facing relationship with said cutting table;
b. a front-trimming knife having the cutting edge thereof extending substantially at an angle to the end portion of each of said side-trimming knives adjacent to the entrance to said cutting table and substantially parallel and in a facing relationship with said cutting table;
c. clamp member;
d. means for resiliently supporting said clamp member adjacent to the cutting edge of each of said trimming knives for applying clamping pressure to a book disposed upon said cutting table when said table is reciprocated toward said cutting knife; and
e. means for adjustably mounting each of said pair of side-trimming knives and said clamp member related thereto with respect to said support member to enable said trimming knives to be spaced in correspondence to the head-to-tail size of the book to be trimmed.

11. A machine in accordance with claim 1 and further comprising:
a. at least one backstop member; and
b. means mounted on said support member for cyclically moving said backstop member between a portion extending into the path of travel of a book with respect to said cutting table when said advancing means advances a book on to said cutting table and a position clear of the path of travel of the book when said advancing means advance the book off said cutting table.

12. A machine in accordance with claim 11 in which said means for cyclically moving said backstop member moves said backstop member toward and away from said cutting table.

13. A machine in accordance with claim 1 and further comprising means mounted on said support member for jogging a book disposed on said cutting table in a direction transverse to the predetermined path of travel of the book with respect to said cutting table.

14. A machine in accordance with claim 13 in which said means for jogging a book comprises:
a. a pair of jogger members disposed spaced apart from one another and adjacent to the side portions of said cutting table disposed at opposite sides of the path of travel of a book; and
b. means for cyclically reciprocating said jogger members in a direction extending at an angle to the path of travel of the book when the book is being advanced on to said cutting table by said advancing means.

15. A machine in accordance with claim 14 and further comprising means for adjustably positioning said means for reciprocating said jogger members on said support members, said positioning means positioning said jogger member along a path extending at an angle to the path of travel of the book with respect to said cutting table.

16. A machine for performing a cutting operation upon a book in accordance with claim 1 in which said means for reciprocating said cutting table comprises: a toggle linkage for supporting said cutting table; and means for oscillating said toggle linkage to reciprocate said cutting table.

17. A machine for performing a cutting operation upon a book in accordance with claim 16 in which said means for oscillating said toggle linkage comprises:
a. a cam; and
b. a cam follower connected to one portion of said toggle linkage,
whereby the engagement of said cam follower with said cam oscillates said toggle linkage.

18. A machine for performing a cutting operation upon a book in accordance with claim 1 and further comprising:
a. means for pivotally mounting said support member with respect to said machine; and

b. means for swinging said support member between an operative position adjacent to said cutting table and a displaced position at a distance from said cutting table,

whereby access is provided to said support member and said cutting table when said support member is in the displaced position.

19. A machine for performing a cutting operation on a book in accordance with claim 18 and further comprising means responsive to said swinging means for interlocking said support member in said operative position and said displaced position.

20. A machine for performing a cutting operation upon a book in accordance with claim 1 and further comprising means disposed adjacent to the portion of said cutting table to which said advancing means advances a book onto said cutting table for urging the binding edge of a book when disposed on said cutting table to a predetermined position thereon.

21. A machine for performing a cutting operation upon a book in accordance with claim 20 in which said means for urging a book to a predetermined position on said cutting table comprises:

a. at least one pusher member;

b. means for cyclically rotating said pusher member from a retracted position clear of the path of travel of a book to an operative position in which said pusher member can contact the front edge of the book in order to urge the book in the direction of the predetermined path of travel to a predetermined position upon said cutting table.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,570,344 Dated March 16, 1971

Inventor(s) Robert A. Bryson and Richard A. Lee

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 64, after "table" insert -- of the machine --

Column 2, line 5, "tale" should be -- table --.

Column 3, line 3, after "25" insert -- (--.

Column 3, delete lines 29 through 37 and insert

-- After the trimming operation has been comple table 29 is lowered and backstops 25 are retracted verti in order to free the binding edge of the book for delive out of the trimming machine. Following the retracting c the backstops, upper transport belt 21 is lowered into engagement with the book and by means of belts 21 and 22 the book is accelerated out of the trimmer. --

Column 3, line 73, "connected to" should be "connected" -- at

Column 4, line 18, after "cam" insert -- 60 --.

Column 5, line 54, after "in" insert -- a --.

Column 5, line 70, after "to" insert -- be --.

Column 8, line 28, after "therebetween" insert -- and --.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,570,344 Dated March 16, 1971

Inventor(s) Robert A. Bryson and Richard A. Lee

It is certified that error appears in the above-identified pate and that said Letters Patent are hereby corrected as shown below:

Column 8, line 62, after "another" insert -- at --.

Column 9, line 7, "placed" should be -- displaced --.

Column 9, line 41, after "and" insert -- a --.

Column 9, line 64, after "an" insert -- angle --.

Column 10, line 14, after "(c)" insert -- a --.

Signed and sealed this 14th day of September 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Pat