

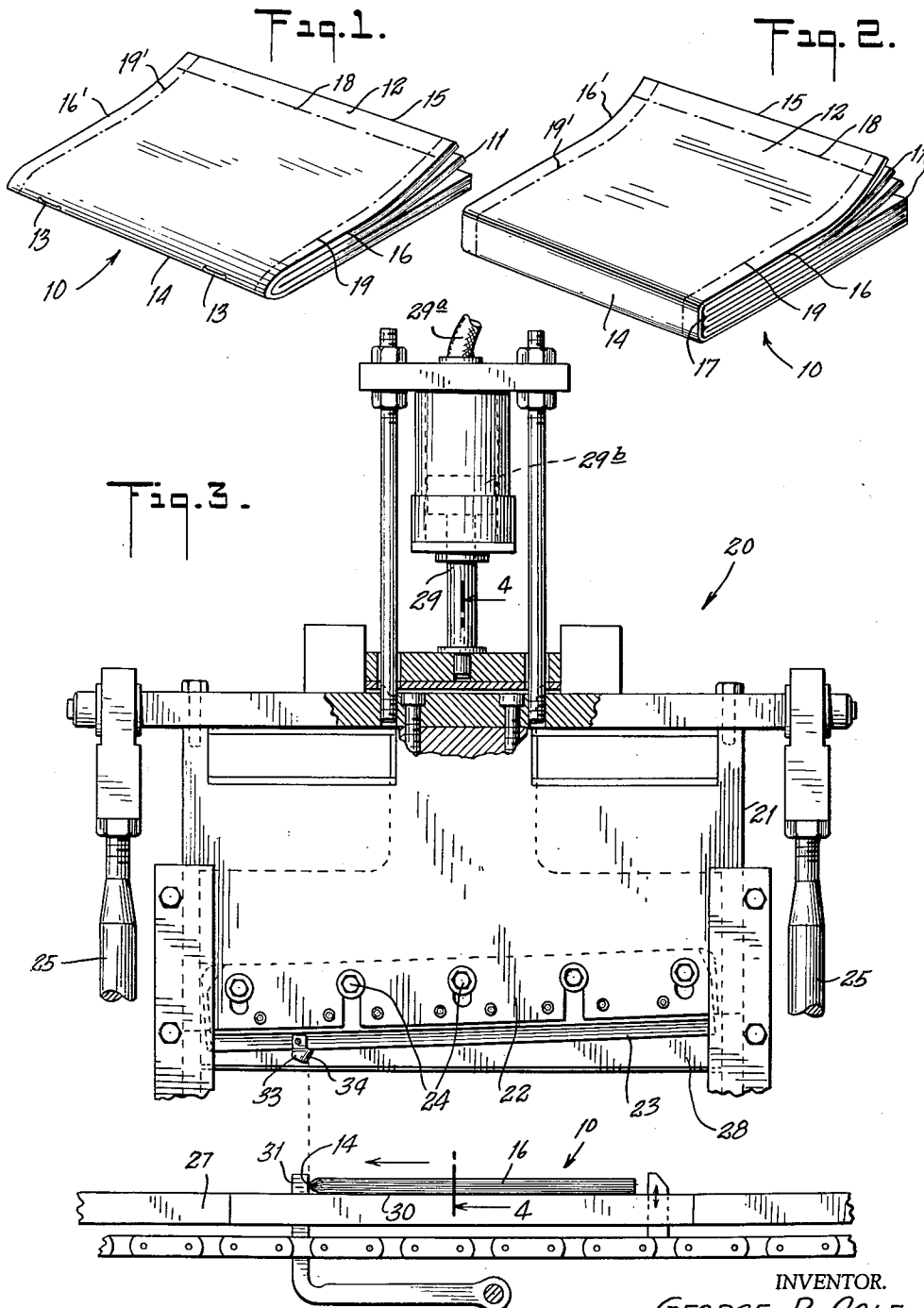
Jan. 22, 1963

G. R. COLE
BOOK TRIMMING MACHINE HAVING ACCESSORY
BLADE TO CUT BOOK BACKBONE

3,074,304

Filed Sept. 24, 1958

2 Sheets-Sheet 1



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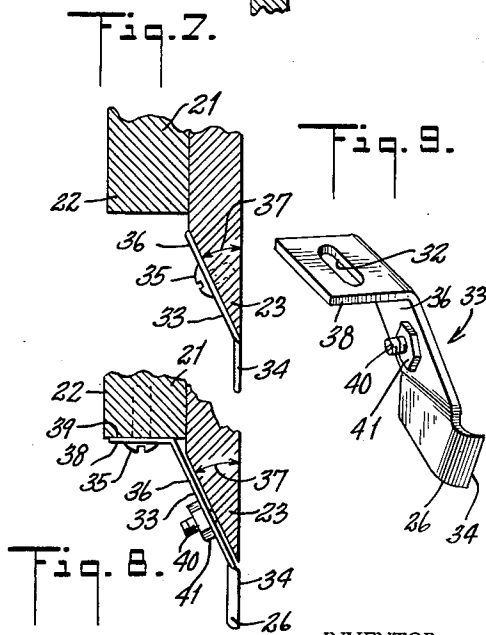
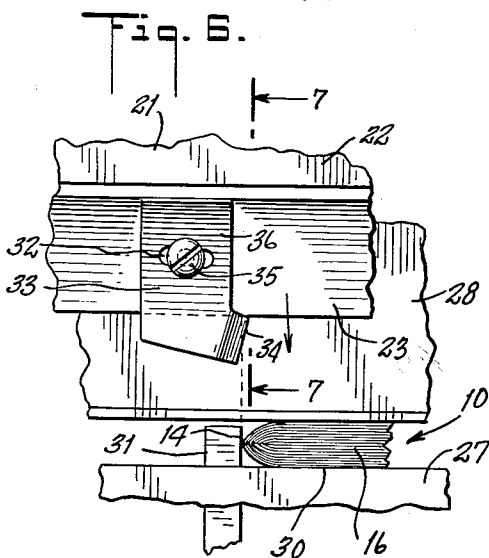
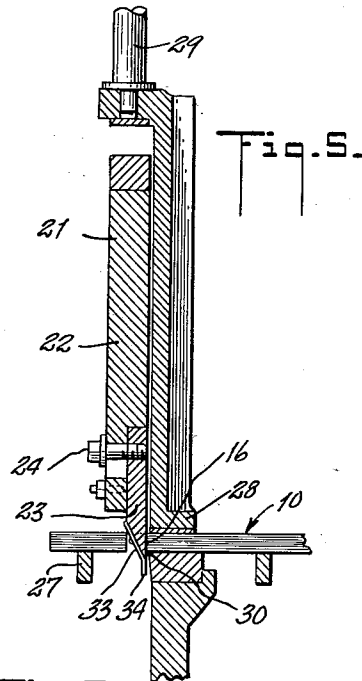
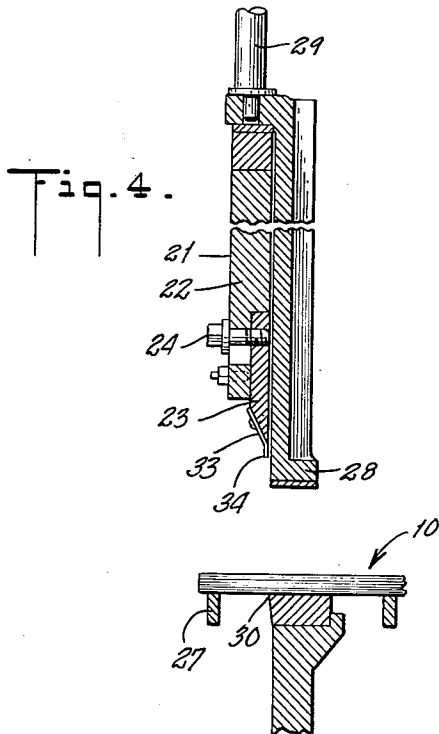
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BOOK TRIMMING MACHINE HAVING ACCESSORY BLADE TO CUT BOOK BACKBONE

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5 Claims. (Cl. 83-456)

This invention relates to book trimming machines and more particularly to apparatus for cutting through the pages of a book to trim the same. It is intended that the term "book" as used herein shall include magazines and similar articles.

In the manufacture of books it is usual to print several pages thereof on a single sheet of paper. A sheet may be folded lengthwise and several times across its width according to a fold pattern, and when so folded is known as a "signature." Several signatures may be stacked one on top of another, or in saddle fashion having a common line of fold, to form a book. A paper cover may be added to enfold the stack of signatures, and the book may be then properly bound together and trimmed to size in a book trimming machine.

As thus formed, a book will have a "backbone edge" formed by the common line of fold of the signatures, a "front edge" opposite the backbone edge which will be the edge from which the book will be opened, and two "side edges" at the top and bottom of the book. In the trimming operation, any lines of fold or unevenness of the signatures at the front, top and bottom edges of the book are sheared off, leaving the pages in separated condition.

A book trimming machine has a stationary work platform on which a book is positioned for trimming an edge thereof under a machine member known to the trade as the main shear. Attached to the main shear, and a part thereof, is a horizontally extending, downwardly directed knife blade which actually cuts the book. The machine is usually provided with clamping apparatus to momentarily clamp the book in place for the cutting operation. The main shear is brought down on the book to trim one of its edges. For clarity, reference is made to a single main shear, although several main shears may be found in a book trimming machine, each to trim a given edge of the book.

Although a main shear may be kept sharp and may be angulated in horizontal direction to provide a slicing action as it passes through the book, it has been found that usual knife blade apparatus does not always cut cleanly, or perfectly straight at the end of the backbone edge of the book along the side edge being trimmed. The cutting action of the main shear more often leaves a slight protrusion or other unevenness of cut thereat, or leaves a tear in the backbone of the book. This may be due to a squeezing or distortion of the pages by the knife or by the clamping apparatus at the end of the common line of fold of the signatures. Furthermore, the backbone edge of the cover may be wet from the application of glue which may cause tearing thereof when a side edge trimming operation is performed using usual knife blade apparatus. This unevenness or tearing damages many otherwise satisfactory printed pages, causing diminution of quality and possible loss of work product.

Accordingly, it is an object of the invention to provide a book trimming apparatus, including a book fold slicer, which will cut through a side edge of a book in a manner avoiding protrusions or other unevenness of the cut at the end of the backbone edge of the book, or a tearing of the backbone.

It is another object of the invention to provide a book fold slicer having a novel construction to facilitate its

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attachment to existing knife blades, including means for the attachment thereof to assure its effective operation.

The invention and other of its objects and achievements will become more fully apparent from the following description and by reference to the drawings in which like elements are similarly numbered throughout.

FIGURE 1 is a perspective view of a stack of signatures enfolded by a book cover as the same would appear before trimming to form a book, to show the relevant parts of the book, and further to show by dotted lines the edges to be trimmed. The signatures are bound together by staples in so-called "saddle stitched" fashion.

FIGURE 2 is a perspective view of a stack of signatures enfolded by a book cover as the same would appear before trimming to form a book. The signatures are bound together in so-called "perfect bound" or in "side wire bound" fashion.

FIGURE 3 is a front elevation of a book trimming machine embodying the invention.

FIGURE 4 is a sectional side elevation of the machine as viewed from line 4-4 in FIGURE 3.

FIGURE 5 is the same sectional side elevation shown in FIGURE 4, but as it would appear during a stroke of the main shear in a cutting or trimming operation.

FIGURE 6 is a front elevation of a portion of the main shear to show in detail a book fold slicer as attached thereto.

FIGURE 7 is a sectional side elevation of the attachment shown in FIGURE 6, taken along line 7-7, to show a book fold slicer in further detail.

FIGURE 8 is a sectional side elevation of a portion of the main shear to show a modified form of book fold slicer attached thereto by a preferred means.

FIGURE 9 is a perspective view of a preferred form of book fold slicer suitable for attachment to existing knife blade apparatus, to show in detail the configuration thereof.

Generally described, the invention consists in improving the cutting action of the knife blade of a main shear on a book trimming machine by providing a depending blade at a location along the knife blade so as to pre-split, or cut cleanly through the end of a book edge which adjoins the edge being trimmed just prior to the main cutting action of the knife blade of the main shear. Thus, a corner region of the book is cut first, eliminating the consequences of distortion thereat as the main shear cuts through the book.

Referring to FIGURES 1 and 2 of the drawings, a book 10 may be formed by stacking and binding several signatures 11 in saddle fashion, as shown in FIGURE 1, or one on top of another in perfect or side wire bound fashion, as shown in FIGURE 2. A book cover 12 enfolds the stacked signatures. As thus formed, a book 10 will have a backbone edge or backbone 14, a front edge 15, and side edges 16 and 16', the latter edges forming the top and bottom of the book. When the book is bound in perfect fashion, as shown in FIGURE 2, the cover 12 is glued to the stack of signatures by glue 17 along the backbone edge 14. When saddle stitched, the book is bound by staples 13. When in either of the conditions described by FIGURES 1 and 2, the book 10 is ready for a trimming operation to be performed along the front edge 15, and along each of the side edges 16 and 16'. The lines of cut along each edge are generally indicated by dotted lines 18, 19 and 19'. The front edge 15 is more often the first of the edges to be trimmed in the book trimming machine, along line of cut 18. Side edges 16 and 16' are thereafter simultaneously trimmed in the machine along lines of cut 19 and 19'. Each of the three edges is usually cut by a separate main shear member 21 of the book trimming machine, each of the main shear members being constructed substantially the same,

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A side slicer arrangement is used for example in FIGURE 3. A main shear 21 of a book trimming machine 20 is generally comprised of knife bar 22 having knife blade 23 bolted on by bolts 24. The main shear 21 is movable vertically downward under the pulling action of draw rods 25 to cut through, or trim a side edge 16 of a book 10 which is positioned on stationary work platform 27 below the knife blade 23. The knife blade 23 extends horizontally at least the width of book 10, and is angulated downward in horizontal direction for shearing action as it cuts through the book. A clamp bar 28, for momentarily clamping book 10 during the trimming operation, is located immediately behind the main shear 21, as more fully appears in FIGURES 4 and 5. The clamp bar 28 is interconnected with main shear 21 to move downwardly therewith by means of an air cylinder connection 29. The clamp bar is arranged to immediately precede the knife blade in contact with the work piece, or book. The platform 27 is provided with a bottom knife 30 past which knife blade 23 moves when cutting through the side edge of the book. Thus, in a trimming operation, draw rods 25 are moved downwardly under the action of a foot pedal or other mechanism (not shown) causing the main shear 21 and the clamp bar 28 to move vertically downward, first to clamp the book 10 in position, and then to cut through or trim a side edge 16 of the book.

Book fold slicer 33 is attached to knife blade 23 of the main shear 21 to cut through backbone edge 14, at the end thereof, just prior to the main cutting action of knife blade 23 through the side edge 16 of book 10. Fold slicer 33 has a depending cutting edge 34 which may be angulated in lateral direction within its vertical cutting plane to cause a slicing or shearing action as it passes through the end of backbone edge 14. That is, the cutting edge of the fold slicer 33 extends downwardly from the cutting edge of the upper knife blade 23 with a substantial angularity from the latter and from the horizontal, said angularity from the horizontal being sufficiently great to slice through the backbone of the book; any angularity of the upper knife's shear or cutting edge from the horizontal being in the same direction therefrom as that of the slicing blade cutting edge and being insufficient to cleanly trim the book's backbone while trimming its side edge. The fold slicer 33 is attached at its body portion 36 to knife blade 23 by a blade screw 35, or by any other convenient means of attachment. Where the knife blade is of hardened steel, or for some other reason may not be drilled into to accommodate blade screw 35, the fold slicer may be attached at a body portion extension 38 directly to knife bar 22 of the main shear member, in the manner shown in FIGURE 8.

The cutting edge 34 of fold slicer 33 should lie within the vertical cutting plane of knife blade 23 so that the lines of cut of both knife edges will coincide. Accordingly, and to facilitate attachment to existing knife blade equipment, fold slicer 33 has its body portion 36 inclined to the vertical cutting plane, as shown in FIGURES 4, 5, 7, 8 and 9. The angle of incline of the body portion 36 corresponds to a bevel angle 37 of the knife blade 23, but may be angled slightly more than the bevel angle 37 to provide for adjustment of cutting plane alignment as will be described. Where the fold slicer is attached to the main shear 21, body portion extension 38 is shaped for attachment to a surface 39 of a member thereof, such a knife bar 22.

As shown in FIGURES 3 and 6, book fold slicer 33 should be located laterally, or horizontally along knife blade 23 at a point so as to be positioned above backbone edge 14 of the book 10. The backbone edge 14 is positioned against a work stop 31 on the platform 27 of the machine. The lower portion of depending cutting edge 34 of fold slicer 33 should extend outward of backbone edge 14, or in lateral direction slightly beyond the vertical line of stop of the work, as will be more appar-

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ent from reference to FIGURES 3 and 6. This may insure a clean, slicing action as the fold slicer passes through backbone edge 14. The location of fold slicer 33 along knife blade 23 may be adjusted accordingly as the width of the book varies from job to job, or as the style of binding may vary, and as the location of the work stop is changed. On "perfect bound" or "side wire bound" books, for example, it may be preferable to position the cutting edge 34 so that only its top portion may pass through backbone edge 14, cutting only the thickness of the cover 12 prior to the cut of knife blade 23 through a side edge 16 of the book 10. This may prevent tearing of the backbone in books bound in this manner.

Referring to FIGURES 4 and 5, the operation of a trimming machine having a book fold slicer attached thereto will consist of positioning the book under the main shear (as shown in FIGURE 4) and bringing the clamp bar and main shear down upon the book (as shown in FIGURE 5) to cut therethrough. Because the trimming apparatus pre-slits the end of the backbone edge of the book (as will be apparent from FIGURES 3 and 6), the main shear cuts cleanly through the entire side edge of the book leaving no protrusions or other unevenness therealong, and no tears in the backbone thereof.

Because the line of cut of fold slicer 33 should be coincident with that of knife blade 23 to extend the latter through the backbone edge 14 of the book, cutting edge 34 may be provided with a lip 26 to curve inwardly towards the vertical cutting plane thereof. Threaded adjustment screw 40, having lock nut 41, may be provided to extend through body portion 36 to engage with knife blade 23 along its bevel edge, as shown in FIGURE 8. By such provision, the alignment of cutting edge 34 within the vertical cutting plane of knife blade 23 is adjustable. When fold slicer 33 is rigidly attached to knife blade 23 or to knife bar 22 by blade screw 35, lip 26 may extend inwardly beyond the desired vertical cutting plane. A few turns of adjustment screw 40 may cause body portion 36 to be backed off, or lifted from contact with knife blade 23, causing cutting edge 24 to move into coincidence with the vertical cutting plane of knife blade 23.

So that fold slicer 33 may be adjusted in lateral, or horizontal direction along knife blade 23, a range of such adjustment may be obtained by providing a slot 32, either in body portion 36 or in body portion extension 38, as shown in several figures of the drawings. Thus, the fold slicer may be moved laterally with relation to blade screw 35 for proper positioning over the backbone edge 14 of the book.

FIGURE 9 shows a book fold slicer having embodied therein all of the preferred features of the invention.

Thus a novel apparatus has been devised which will achieve the objects of the invention and thereby improve the efficiency of book trimming machines.

It can be seen that this book trimmer has the platform or table 27 provided with the work stop 31 forming a means for positioning the book at a predetermined location on this table. The slicing shear blade 33 has the means previously described for reciprocating it through the backbone of this book substantially in slicing relation with this backbone. The big guillotine type shear blade 23 is in the nature of a chopping shear blade and because it is interconnected for simultaneous reciprocation with the slicing blade located in advance of it, this chopping blade has a means for reciprocating it after the slicing blade's described action. This big blade moves through the book substantially in chopping relation with its entire side at right angles to the book's backbone. The thickness of the book causes the action to be more like chopping than true shearing until the large blade approaches the lower stationary knife blade on the table or platform.

The slicing angularity of the slicing blade causes it to exert the maximum horizontal displacement force on

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the book. The angularity of the chopping blade is very slight by comparison. If the clamping bar 28 were actuated by a spring to keep it in advance of the two blades and to take up the lost motion as the blades respectively slice and chop the book to trim it, the clamping pressure would be the least during the action of the slicing blade when the greatest clamping force is needed. The air cylinder connection 29 which in this instance controls the lost motion, instead of a spring, has an air inlet connection 29a to which air under a constant pressure may be applied to urge the clamping bar towards its most advanced position. This air cylinder 29, of course, contains the usual piston 29b against which the air pressure is exerted.

Therefore, when the clamping bar first engages the book just slightly in advance of the slicing blade's edge 34 the clamping bar immediately exerts its full clamping action which does not change appreciably throughout the slicing and chopping stroke of the two blades. Thus there is a clamping pressure which is substantially constant at all times so that it may be made great enough at the start to avoid displacement of the book during the slicing action on its backbone without resulting in the pressure build-up inherent to the use of a spring and which might result in either marking the book during the chopping action or at least making the machine consume excessive power uselessly.

An attempt to increase the angularity from horizontal of the main upper knife blade 23 to a degree approaching the angularity of the slicing blade 33 would increase the necessary opening upward motion of the blade 23 to an impractical degree. Book trimming must be done by rapidly feeding one book after another to the trimming location to achieve the currently necessary high production rate. It would be impossible to reciprocate the upper blade through the excessively long traveling path which would be demanded by any substantial increase in this blade's normal angularity. The book backbone slicer 33 is a very short blade, which permits this blade to have its great angularity required for slicing action, without materially lengthening the normal stroke of the upper knife blade. Because of its shortness and its great angularity from the horizontal, this slicing blade may be made from relatively thin stock, as contrasted to the massiveness of the main knife blade, required because of the great stress involved by its chopping action through the book. Therefore, it is possible to make this slicing blade sharper than the main knife and thus obtain a very clean trimming of the book's backbone.

I claim:

1. A book trimming machine including a bottom knife blade having a flat horizontal top side terminating with a straight shear edge having at least a length sufficient for trimming the side edge of a book located thereon, an upper knife blade having a flat side and a beveled side joining therewith to form a shear edge having a length providing shearing action at least along said length of the lower blade, means for mounting said upper knife with its flat side and shear edge in a vertical plane substantially aligned with the lower knife's shear edge and for reciprocation between an up position where the upper knife's shear edge completely clears the bottom knife and a down position where this edge is below the lower knife's shear edge, and a book backbone slicing blade connected to said upper blade and having a cutting edge located in said vertical plane and extending downwardly from the upper knife's shear edge with a substantial angularity from said upper knife's shear edge and from the horizontal, said angularity from said horizontal being sufficiently great to slice through said backbone in advance of the upper knife's shear edge and cleanly trim said backbone, any angularity of the upper knife's shear edge from horizontal being in the same direction therefrom as that of said slicing blade cutting edge and being insufficient to cleanly trim the book's backbone while trimming its side edge, said slicing blade being long enough

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in relation to its angularity to trim the book's backbone but being relatively short as compared to the length of said upper blade, and the slicing blade being connected to the upper knife at a location causing the slicing blade's edge to register with the backbone of the book when the latter is positioned on the lower knife for trimming of its side edge by the upper knife's shear edge.

2. The machine of claim 1 wherein the slicing blade is a part separate from the upper blade and having a body portion extending upwardly at an incline and located on the bevel of the upper blade's beveled side, mutually registered holes being formed in this beveled side and through the slicing blade's said body portion, and fastening means extending through the fold slicer's body portion hole and interengagingly into the upper knife's hole and terminating short of the upper knife's flat side.

3. The machine of claim 1 and having an upper knife mounting bar providing on the upper knife's beveled side a projection adjacent to the slicing blade's location, and the slicing blade being a part separate from the upper blade and having a body portion extending upwardly at an incline and passing the upper knife's bevel and to said projection and having means for fastening this body portion to this projection, the slicing blade's body portion being springy and having means for springing it adjustably from the upper knife to adjust the alignment of the slicing blade's cutting edge with the shear edge of the upper knife.

4. A book trimming machine including a bottom knife blade having a flat horizontal top side terminating with a straight shear edge having at least a length sufficient for trimming the side edge of a book located thereon, an upper knife blade having a flat side and a beveled side joining therewith to form a shear edge having a length providing shearing action at least along said length of the lower blade, means for mounting said upper knife with its flat side and shear edge in a vertical plane substantially aligned with the lower knife's shear edge and for reciprocation between an up position where the upper knife's shear edge completely clears the bottom knife and a down position where this edge is below the lower knife's shear edge, and a book backbone slicing blade connected to said upper blade and having a cutting edge located in said vertical plane and extending downwardly from the upper knife's shear edge with a substantial angularity from said upper knife's shear edge and from the horizontal, said angularity from said horizontal being sufficiently great to slice through said backbone in advance of the upper knife's shear edge and cleanly trim said backbone, any angularity of the upper knife's shear edge from horizontal being in the same direction therefrom as that of said slicing blade cutting edge and being insufficient to cleanly trim the book's backbone while trimming its side edge, said slicing blade being long enough in relation to its angularity to trim the book's backbone but being relatively short as compared to the length of said upper blade, and the slicing blade being connected to the upper knife at a location causing the slicing blade's edge to register with the backbone of the book when the latter is positioned on the lower knife for trimming of its side edge by the upper knife's shear edge, said machine including a table located to support the body of the book on said bottom knife for trimming, a book clamp vertically reciprocatively located adjacent to said bottom knife and having an extent for clamping and holding the book on the table throughout the length of the book's side edge while the slicing blade's cutting edge is trimming the book's backbone and the upper knife blade's edge is trimming the book's side edge.

5. A book trimming machine including a bottom knife blade having a flat horizontal top side terminating with a straight shear edge having at least a length sufficient for trimming the side edge of a book located thereon, an upper knife blade having a flat side and a beveled side

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joining therewith to form a shear edge having a length providing shearing action at least along said length of the lower blade, means for mounting said upper knife with its flat side and shear edge in a vertical plane substantially aligned with the lower knife's shear edge and for reciprocation between an up position where the upper knife's shear edge completely clears the bottom knife and a down position where this edge is below the lower knife's shear edge, and a book backbone slicing blade connected to said upper blade and having a cutting edge located in said vertical plane and extending downwardly from the upper knife's shear edge with a substantial angularity from said upper knife's shear edge and from the horizontal, said angularity from said horizontal being sufficiently great to slice through said backbone in advance of the upper knife's shear edge and cleanly trim said backbone, any angularity of the upper knife's shear edge from horizontal being in the same direction therefrom as that of said slicing blade cutting edge and being insufficient to cleanly trim the book's backbone while trimming its side edge, said slicing blade being long enough in relation to its angularity to trim the book's backbone but being relatively short as compared to the length of said upper blade, and the slicing blade being connected to the upper knife at a location causing the slicing blade's edge to register with the backbone of the book when the latter is positioned on the lower knife for

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trimming of its side edge by the upper knife's shear edge, said machine including a table located to support the body of the book on said bottom knife for trimming, a book clamp vertically reciprocally located adjacent to said bottom knife and having an extent for clamping and holding the book on the table throughout the length of the book's side edge while the slicing blade's cutting edge is trimming the book's backbone and the upper knife blade's edge is trimming the book's side edge, and means for interconnecting the upper blade and said book's clamp to move the latter downwardly in advance of the slicing and upper blade cutting edges to clamping position on the book with a lost motion having a constant lost motion displacement restraint great enough to hold the book against displacement by the slicing blade's trimming action on the book's backbone but insufficient to cause the clamp to mark the book.

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