

Sept. 15, 1964

C. H. HEIGL ETAL
TRIMMING MECHANISM

3,148,574

Filed April 6, 1959

3 Sheets-Sheet 1

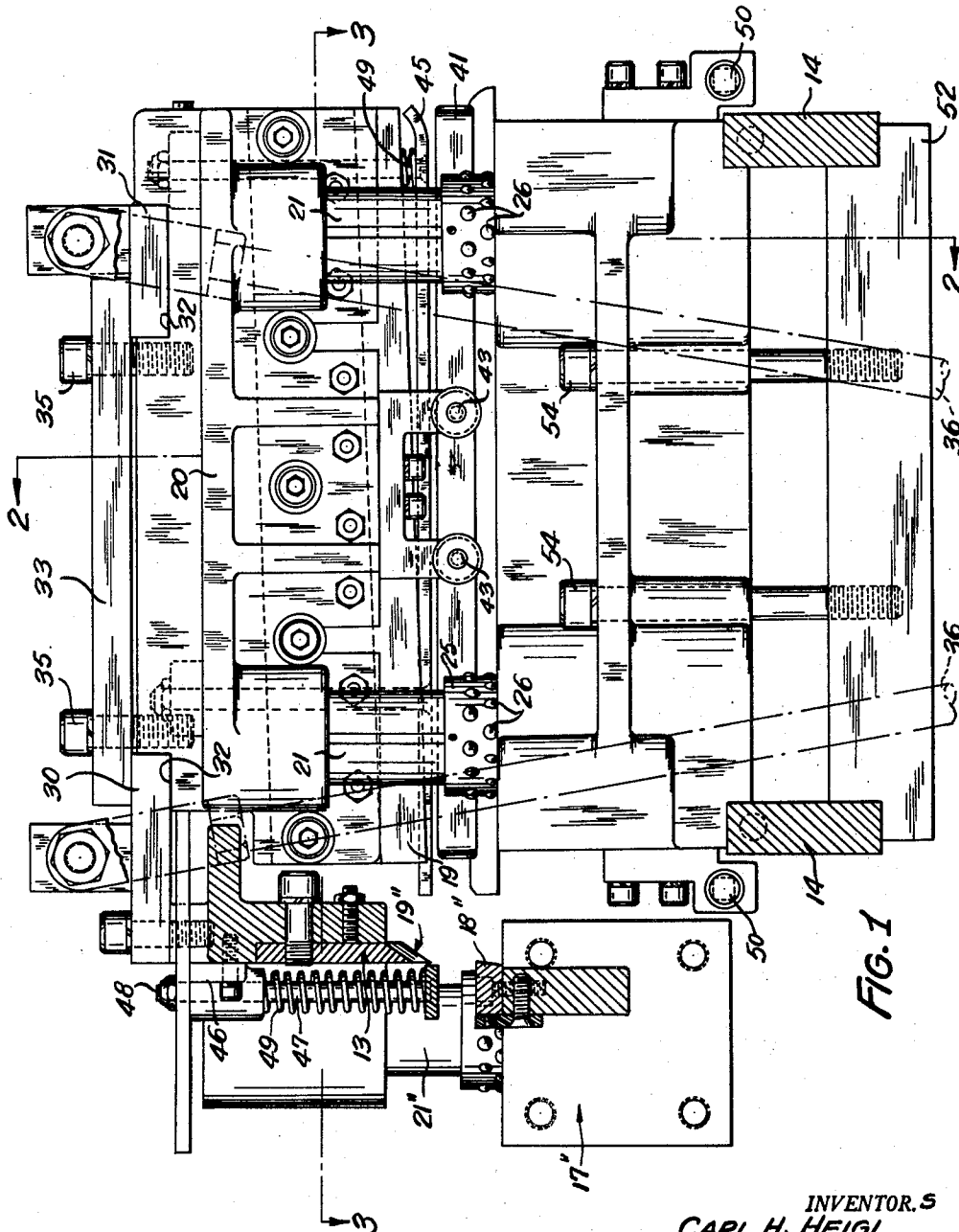


FIG. 1

INVENTOR.S
CARL H. HEIGL
BY VICTOR A. ZUGEL
Hudson, Daughton,
Williams, David & Hoffmann
ATTORNEYS

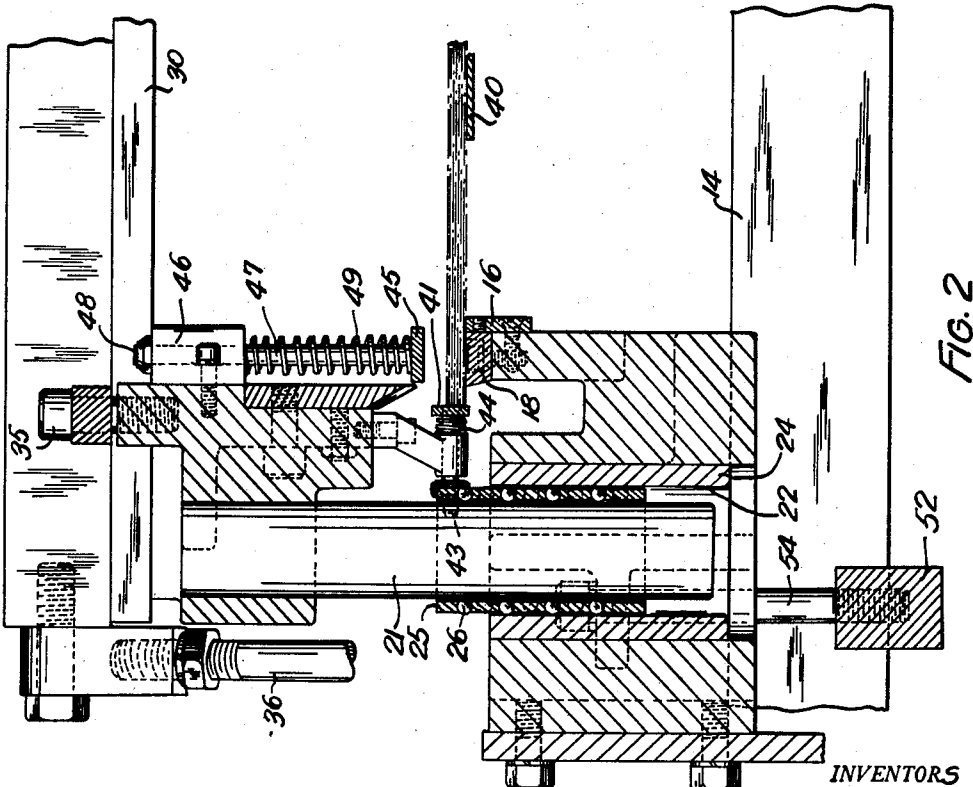
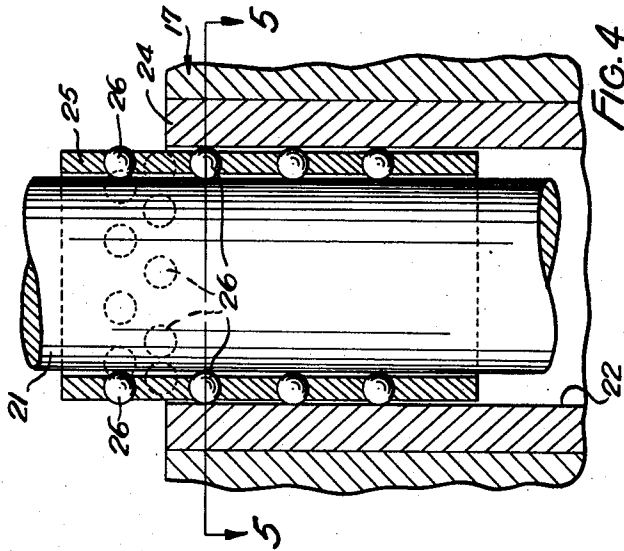
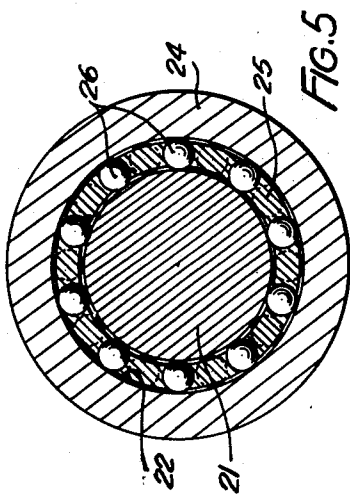
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3,148,574

Filed April 6, 1959

3 Sheets-Sheet 2



INVENTORS
CARL H. HEIGL
BY VICTOR A. ZUGEL
*Hudson, Boughton,
Williams, David & Hoffmann*
ATTORNEYS

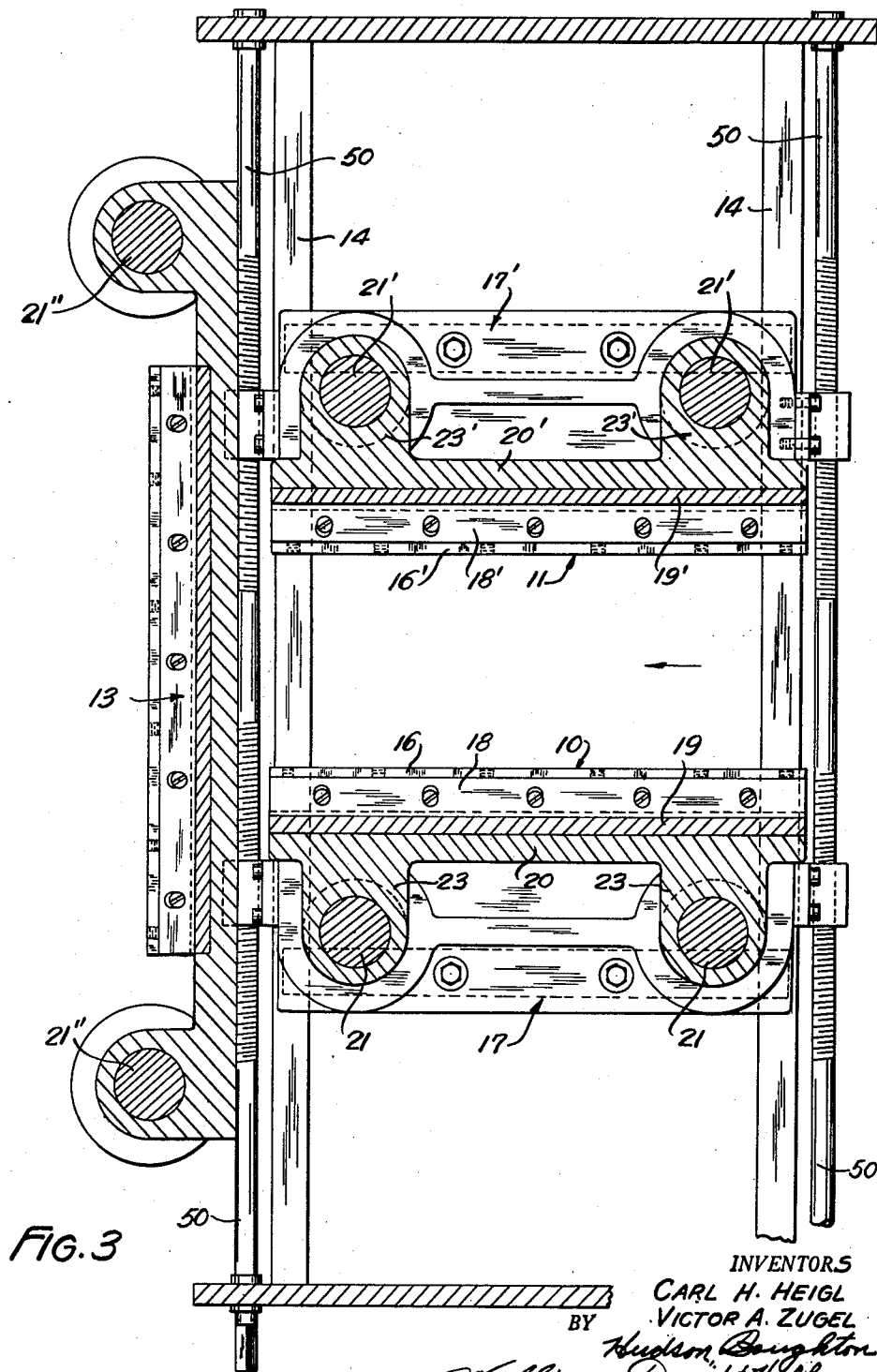
Sept. 15, 1964

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Filed April 6, 1959

3 Sheets-Sheet 3



INVENTORS
CARL H. HEIGL
VICTOR A. ZUGEL
BY *Hudson, Baughman*
Williams, David & Hoffmann
ATTORNEY

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3,148,574

TRIMMING MECHANISM

Carl H. Heigl, Bay Village, and Victor A. Zugel, Parma, Ohio, assignors, by mesne assignments, to Harris-Inter-type Corporation, Cleveland, Ohio, a corporation of Delaware

Filed Apr. 6, 1959, Ser. No. 804,349
3 Claims. (Cl. 83—560)

The present invention relates to trimmers and, more particularly, to a shear or trimming mechanism for use in connection with a series of folded sheets collated to form a magazine, pamphlet, book or the like. For the purpose of simplicity the term "book" shall be used in the remainder of the specification and claims to indicate a plurality of superposed signatures, regardless of whether the superposed signatures form a book, pamphlet, magazine or the like.

After folded sheets or signatures have been collated to form a book the books are usually trimmed on top and bottom and along one side, the side opposite the folded side. For trimming, the book may be disposed endwise between a pair of trimming knives which are operated simultaneously to trim the top and bottom of the book and the book then indexed to another position where the side of the book is trimmed by a third knife. The three knives may be arranged in a U-shaped configuration and reciprocated simultaneously with each other, the two oppositely disposed knives for trimming the top and bottom of the book operating on one book and the third knife which is disposed transversely of the first two knives operating on a different book.

The conventional supports and guides for the movable knives of trimming mechanisms, such as ways and gibs require close tolerance machining and are subject to relatively fast wear and require good lubrication and constant adjustment to assure that the movable knife operates in the proper plane. Furthermore, the conventional type guides for the moving knives of trimming mechanisms, including the way and gib-type guide, have been relatively cumbersome and have presented space problems when the knives are to be ganged to operate simultaneously on a relatively small sheet or book or on two or more closely disposed books at adjacent index stations.

It is well understood by those skilled in the art that the movable knife of a paper shear or trimming mechanism must move accurately in a predetermined plane and a close adjustment between the movable knife and the bed knife must be maintained.

One of the important object of the present invention is to provide a novel and an improved shear or trimming mechanism, particularly one for cutting paper, in which the movable knife is supported and guided in such a manner that little maintenance and adjustment is required to maintain the knife operating in the proper cooperative relationship with the fixed knife of the trimming mechanism or shear.

Another object of the present invention is to provide a trimmer or shear having new and improved guides for a plurality of movable knives thereof which enables the knives to be ganged in a relatively small space and which does not require frequent or constant adjustment due to or because of wear in the guides for the movable knives.

Yet another object of the present invention is to provide a shear or trimming mechanism in which a pair of par-

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allel knives are guided for cutting movement by compact guide means on carriages which are movable toward and away from each other to adjust the position of the knives to trim a sheet or signature disposed therebetween.

A still further object of the present invention is to provide a novel and an improved shear or trimming mechanism, as in the preceding object, in which a third knife is disposed at corresponding one ends of the first-mentioned knives and extends transversely thereto and is movable with the first-mentioned knives to effect a cut.

Other objects and features of the invention will appear as we proceed with the description of the preferred embodiment of the invention illustrated in the accompanying drawings forming a part of this specification and in which:

FIG. 1 is a side elevation of a mechanism embodying the present invention with parts thereof shown in section;

FIG. 2 is a fragmentary transverse view partly in section on the line 2—2 of FIG. 1;

FIG. 3 is a reduced horizontal sectional view taken approximately along line 3—3 of FIG. 1 with the book handling mechanism and book hold-downs omitted;

FIG. 4 is a vertical sectional view on a larger scale of one of the sleeve assemblies for guiding the relative movements of the post and bushing and holding those parts properly centered; and

FIG. 5 is a horizontal sectional view taken substantially on the line 5—5 of FIG. 4.

In the trimming mechanism shown in the drawings, first and second shear assemblies 10, 11 and 19, 19' are disposed opposite each other and are adapted to trim the ends of a book disposed therebetween. A third shearing assembly 13 extends across or between the assemblies 10, 11 at one of their ends and is adapted to trim the side of the book after the ends thereof have been trimmed by the assemblies 10, 11 and the book indexed to a subsequent position. The book being trimmed by the assembly 13 may be supported on the table means of a delivery mechanism not shown.

The assemblies 10, 11 are supported on a pair of transverse bars or rails 14 and are movable along the rails to vary the distance therebetween to permit the shears to be adjusted for trimming books of various lengths.

The assemblies 10, 11 are substantially identical in construction and for the sake of clarity and simplicity, only the shear assembly 10 will be described in detail. The parts of the shearing assembly 11 will be given the same number as the corresponding parts of the shearing assembly 10 with a prime mark affixed thereto unless otherwise indicated hereinafter.

The shear assembly 10 is shown as including a bed member 17 slidably supported by the rails 14 and a bed knife 18 which is clamped by screws to the bed member 17. The screws for clamping the knife 18 to the bed member 17 pass through enlarged openings in the knife 18 to permit lateral adjustment of the knife and the knife is backed by a bar 16 which is fixed to the bed member 17. The bar 16 carries adjustable set screws that engage the bed knife 18 to determine its lateral position. The bed knife 18 and bar 16 extend longitudinally of the trimming mechanism and transversely to the rails 14.

The bed knife 18 cooperates with a movable knife 19 disposed above the bed knife, the movable knife 19 being reciprocated to effect a shearing of the book or sheet disposed between the bed knife and the movable knife. The movable knife 19 is fixed to a knife support member 20

which is guided for movement in a vertical plane and is reciprocated to operate the movable knife 19. The knife support member 20 is constrained to move vertically by guide rods 21, preferably of hardened steel, which depend from the knife support member 20 and which are received in respective vertical bores 22 in the bed member 17.

In the illustrated and preferred embodiment, the upper ends of the guide rods 21 are pressed into receiving bores in bosses 23 of the knife support member 20, but it will be understood that the guide rods may be connected to the knife support member 20 in any suitable manner.

The diameter of each bore 22 in the bed member 17 for receiving a corresponding one of the guideposts 21, has a larger diameter than the guidepost received thereby. The bore 22 is preferably provided by the opening in a hardened steel bushing 24 pressed into a bore in the bed member 17, and a sleeve 25 is disposed in each bore 22 between the side walls of the bore and the corresponding guidepost. The sleeves 25 have an inside diameter greater than the diameter of the guidepost and an outside diameter which is smaller than the diameter of the corresponding bore 22. The sleeves 25 each have a plurality of openings therein in which hardened steel balls are disposed and the balls are of a diameter such that the balls fit tightly within the clearance between the guidepost 21 and the side wall of its receiving bore and provide an antifricition means for accurately guiding the guideposts 21 and, in turn, the knife support member 20 in their vertical movement. In the illustrated and preferred embodiment the diameter of the guidepost 21 plus the diameters of two balls 26 is slightly larger than the diameter of its receiving bore 22. This provides the equivalent of a press fit and positively prevents any lateral motion between guideposts and the bed member 17. Each of the balls 26 are received in an individual aperture in its supporting sleeve 25 and are free to rotate relative to the sleeve. The balls may be held against displacement when the sleeve is disassembled from the shear by peening the ends of the side wall of their receiving aperture. The balls of each sleeve 25 are preferably arranged in rows about the circumference of the sleeve 29 with the balls in adjacent rows being offset from each other as shown in the drawing. The sleeve 25 and the balls therein may float axially relative to the guidepost 21 and the side walls of the bore 22.

The knife support members 20, 20' of the assemblies 10, 11 are reciprocated vertically by drive plates 30, 31 which extend between the knife support members 20, 20' at the upper sides thereof and at opposite ends of the assemblies 10, 11. The drive plates are received in individual cutout portions 32 of each of the knife support members 20, 20' and a bar 33 is disposed above each knife support member and extends over the drive plates 30, 31. The bars 33 are connected to the adjacent one of the knife support members by clamp screws 35 which draw the bars 33 against the drive plate and which may be loosened to permit the knife support members 20, 20' to slide along the drive plates 30, 31 as the assemblies 10, 11 are moved along the rails 14. The drive plates 30, 31 are reciprocated vertically by a pair of links 36 connected at their upper ends to respective ones of the drive plates and to operating mechanism for effecting a reciprocation of the links and the drive plates.

As pointed out hereinbefore, the shear assembly 13 is disposed at the left-hand ends of the shear assemblies 10, 11 as the mechanism is viewed in the drawings. The structure of the shear assembly 13 is substantially the same as the structure of the shear assembly 10, 11 but the bed member and movable knife support thereof are of slightly modified construction in order to facilitate the disposal of the shear assembly 13 at the ends of the shear assemblies 10, 11 and to dispose the knives thereof transversely of the machine adjacent the shear assemblies 10, 11 with the supporting structure for the knives being primarily on the side of the knife remote from the shear as-

semblies 10, 11. The parts of the shear assembly 13 have been given the same number as the corresponding parts of the shear assembly 10 with a double prime mark affixed thereto. It is desirable to dispose the shear assembly 13 closely to the ends of the shear assemblies 10, 11 to minimize the distance that the book has to be moved from where it is trimmed by the shear assemblies 10, 11 into position to be trimmed by the shear assembly 13. The book when trimmed by the shear assembly 13 extends to the left from the knives 18', 19' and the shear assembly 13.

The knife support member 20'' of the shear 13 is disposed adjacent the drive plate 30 and is connected to the drive plate for actuation thereby upon reciprocation of the drive plate. The vertical movement of the knife support 20'' is guided by a pair of guideposts 21'' which are guided in their vertical movement in individual receiving bores in the bed 17'' of the shear assembly 13 in the same manner as the guideposts 21 of the shear assembly 10.

It is understood that suitable indexing mechanism may be provided to move the books into a position to be trimmed by the shear assembly 10, 11 and then to index the book to a position to be trimmed by the shear assembly 13. The indexing mechanism forms no part of the present invention and has, therefore, not been described or shown. Suffice it to say that an indexing mechanism including a plurality of spaced pushers supported for rectilinear movement may be utilized to advance the book. The books may ride on a table which includes a member 40 disposed midway between the shear assemblies 10, 11 and as the books are moved into position to be trimmed by the shear assemblies 10, 11 they may be guided by guides 41 carried by the knife support members 20, 20', respectively, and disposed immediately outwardly of the adjacent bed knife when the knife support member is in a raised position. The guides 41 are adjustably supported from the corresponding knife support member for lateral movement by studs 43 which extend through a portion of the corresponding movable knife support member. The studs 43 have nuts threaded on their outer ends and a spring 44 is disposed about each stud between the guide and the knife support member. The springs 44 urge the guides inwardly until the adjustable nuts on the studs engage the adjacent knife support member.

The knife support members 20, 20' and 20'' also carry, in the illustrated embodiment, book hold-downs 45. Each book hold-down is supported from a plate 46, connected to the corresponding knife support member, by vertical rods 47, which extend freely upwardly through the plate and each having a nut 48 threaded onto its upper end. The nuts 48 limit the downward movement of the corresponding hold-down and the hold-downs are urged downwardly to urge the nuts 48 into engagement with the adjacent plates 46 by springs 49 disposed about the rods between the hold-downs and the plates 46. Each hold-down member 45 leads the adjacent movable knife and effects a clamping of the book against the bed member before the book is engaged by the movable knife. When the movement of the hold-down member is stopped, the springs 49 will compress to allow the knife support member to move relative to the hold-down.

As mentioned hereinbefore, the shear assemblies 10, 11 are adjustable toward each other. The adjustment of the shear assemblies 10, 11 toward and away from each other is effected by the operation of a pair of lead screws 50 extending between the assemblies, one of the lead screws being disposed at each of the ends of the assemblies 10, 11. The lead screws 50 thread into brackets carried by the bed members 17, 17' and the threaded portions of each screw in the brackets connected to the bed member 20 are of opposite hand to the threaded portions of the screws operating in the brackets connected to the bed members 20'. Upon rotation of the lead screw 50, the shear assemblies 10 and 11 will be moved toward or

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away from each other depending upon rotation of the lead screw. The lead screws are preferably interconnected by a chain, not shown, which meshes with a sprocket, not shown, on each lead screw so that the screws rotate in unison and the same angular amount each time they are operated so that the shear assemblies 10, 11 are always equidistant from a centerline between the assemblies.

After the shear assemblies 10, 11 have been properly adjusted, they may be clamped into position by means of clamp bars 52. A clamp bar 52 is disposed underneath the rails 14 in alignment with each bed member and are connected to their respective beds by clamp screws designated by the reference numerals 54. The clamp screws may be tightened or loosened to effect a clamping of the bed members to the rails 14.

When the movable knives of the shear assemblies 10, 11, 13 are guided in their vertical movements in accordance with the present invention, the knives do not require constant adjustment as is true of the support of the knives guided in a conventional manner. The guideposts, the side walls of the bores receiving the guideposts, and the balls interposed between the guideposts and the side walls may all be of relatively hard materials and are not subject to wear. Furthermore, when the knives are guided in accordance with the present invention, a plurality of knives may be ganged in an extremely small space and the mechanism may be constructed to facilitate the adjustment of the shears provided by the knives to properly position the shears to perform simultaneous cuts on the same sheet or book.

It can now be seen that the present invention provides a novel and an improved timing mechanism or shear that can be used to trim a book of signatures or a single sheet or pack of sheets and it will be understood that further modifications, constructions and arrangements can be made within the ability of those skilled in the art, and it is hereby our intention to cover all such constructions, modifications and arrangements which fall within the ability of those skilled in the art and within the scope and spirit of the present invention.

Having thus described our invention, what we claim is:

1. In a paper trimming mechanism comprising a pair of opposed ganged shears for simultaneously trimming different marginal portions of a book, each of said shears comprising: a bed member, a stationary knife on said bed member, a movable knife support member, a movable knife adapted to lie in a plane and having an edge in said plane to cooperate with said stationary knife on movement of said knife in said plane, fastening means connecting said knife to said movable knife support member for movement therewith, guide means connecting said movable knife support member to said bed member and constituting the sole guide means therebetween and consisting of a plurality of guide posts connected to one of said bed and support members and the other of said bed and support members having a bore therein receiving and coaxial with each of said guide posts with said bores having larger diameters than said guide posts to provide clearance between said guide posts and their receiving member, a sleeve disposed about each of said guide posts and received in the bore receiving the guide post, said sleeves each having an outside diameter less than the diameter of the receiving bore, and a plurality of balls rotatably carried by each of said sleeves in spaced relationship to each other and engaging the side wall of the receiving bore; means supporting said shears with the knives thereof parallel to each other and for movement toward and away from each other; a connecting member interconnecting said movable knife support members of said shears to effect movement of said knife support members in unison relative to the bed members; connecting means connecting knife support members to said connecting member and providing for relative movement of said knife support members toward and away from each other; means connected to said movable knife sup-

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port members and said connecting member to effect reciprocation thereof as a unit; and adjustment means operatively connected between said bed members for moving said bed members toward and away from each other in unison to move said pair of shears toward and away from each other.

2. In a paper trimming mechanism comprising a pair of ganged shears for simultaneously trimming opposite marginal portions of a book, each of said shears comprising: a bed member, a stationary knife on said bed member, a movable knife support member, and guide means connecting said movable knife support member to said bed member and constituting the sole guide means therebetween; means supporting said shears with the knives thereof parallel to each other and for movement toward and away from each other; a connecting member interconnecting said movable knife support members of said shears to effect movement of said knife support members in unison relative to the bed members; connecting means connecting said knife support members to said connecting member and providing for relative movement of said knife support members toward and away from each other; means connected to said movable knife support members and said connecting member to effect reciprocation thereof as a unit toward and away from said bed members; adjustment means operatively connected between said bed members for moving said bed members toward and away from each other in unison to move said shears toward and away from each other; a third movable knife fixed to said connecting member; a bed member having a stationary knife adapted to cooperate with said third movable knife; and guide means guiding said connecting member relative to said bed member supporting said third movable knife; each of said guide means consisting of: a plurality of guide posts connected to one of said bed and support members and the other of said bed and support members having a bore therein receiving and coaxial with each of said guide posts with said bores having larger diameters than said guide posts to provide clearance between said guide posts and their receiving member, a sleeve disposed about each of said guide posts and received in the bore receiving the guide post, said sleeves each having an outside diameter less than the diameter of the receiving bore, and a plurality of balls rotatably carried by each of said sleeves in spaced relationship to each other and engaging the side wall of the receiving bore.

3. In a paper trimming mechanism comprising a pair of ganged shears for simultaneously trimming opposite marginal portions of a book, each of said shears comprising: a bed member, a stationary knife on said bed member, a movable knife support member, and guide means connecting said movable knife support member to said bed member and constituting the sole guide means therebetween; means supporting said shears with the knives thereof parallel to each other and for movement toward and away from each other; a connecting member interconnecting said movable knife support members of said shears to effect movement of said knife support members in unison relative to the bed members, connecting means connecting said knife support members to said connecting member and providing for relative movement of said knife support members toward and away from each other; means connected to said movable knife support members and said connecting member to effect reciprocation thereof as a unit toward and away from said bed members; adjustment means operatively connected between said bed members for moving said bed members toward and away from each other in unison to move said shears toward and away from each other; a third movable knife fixed to said connecting member; a bed member having a stationary knife adapted to cooperate with said third movable knife; and guide means guiding said connecting member relative to said bed member.

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**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,148,574

September 15, 1964

Carl H. Heigl et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 72, before "knife" insert -- said --.

Signed and sealed this 12th day of January 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents