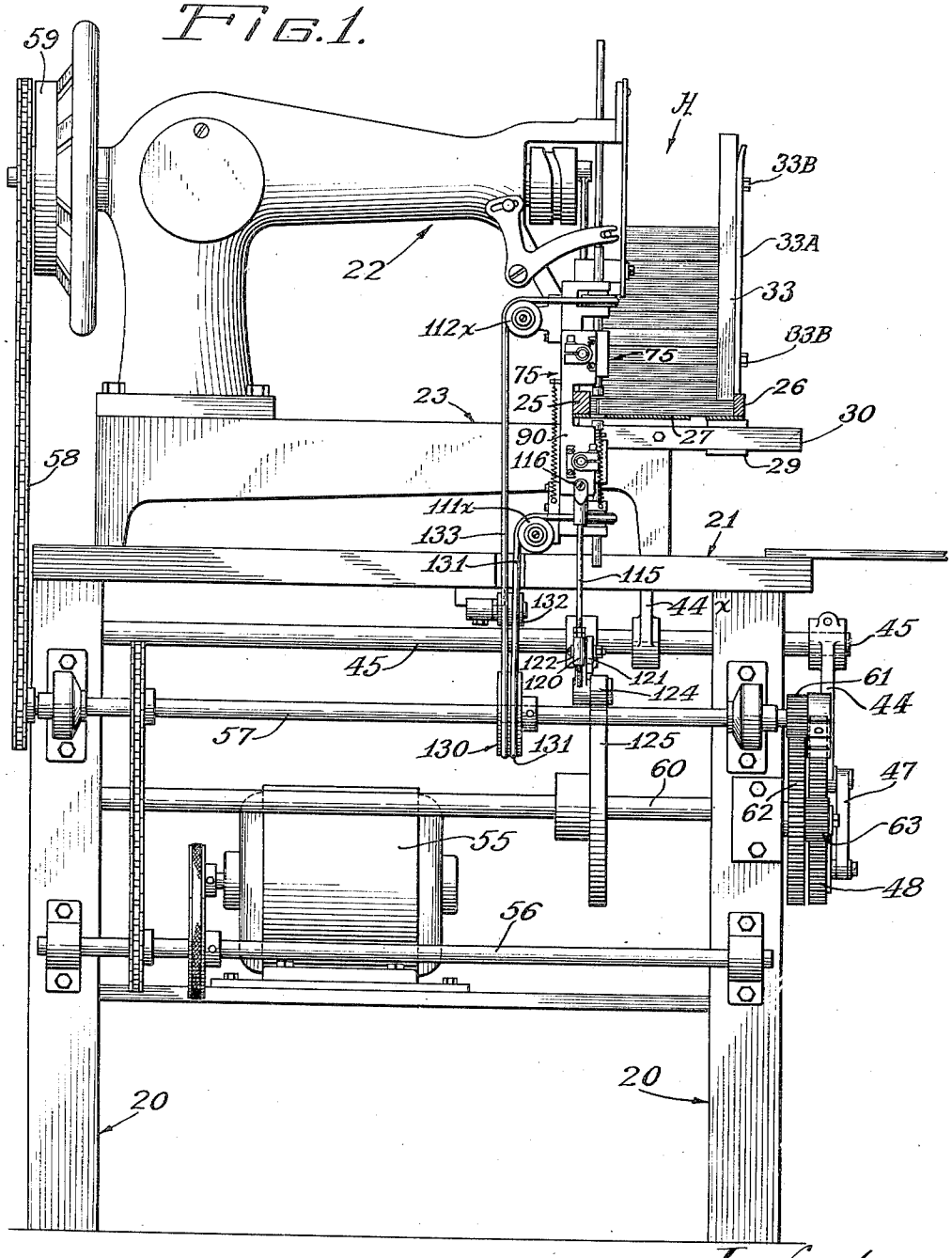
Jan. 31, 1950 W. B. HILDMANN 2,496,211

AUTOMATIC THREAD CUTTER AND REGISTER MEANS FOR BOOK SEWING MACHINES

Filed June 8, 1944 5 Sheets-Sheet 1

Fig. 1.



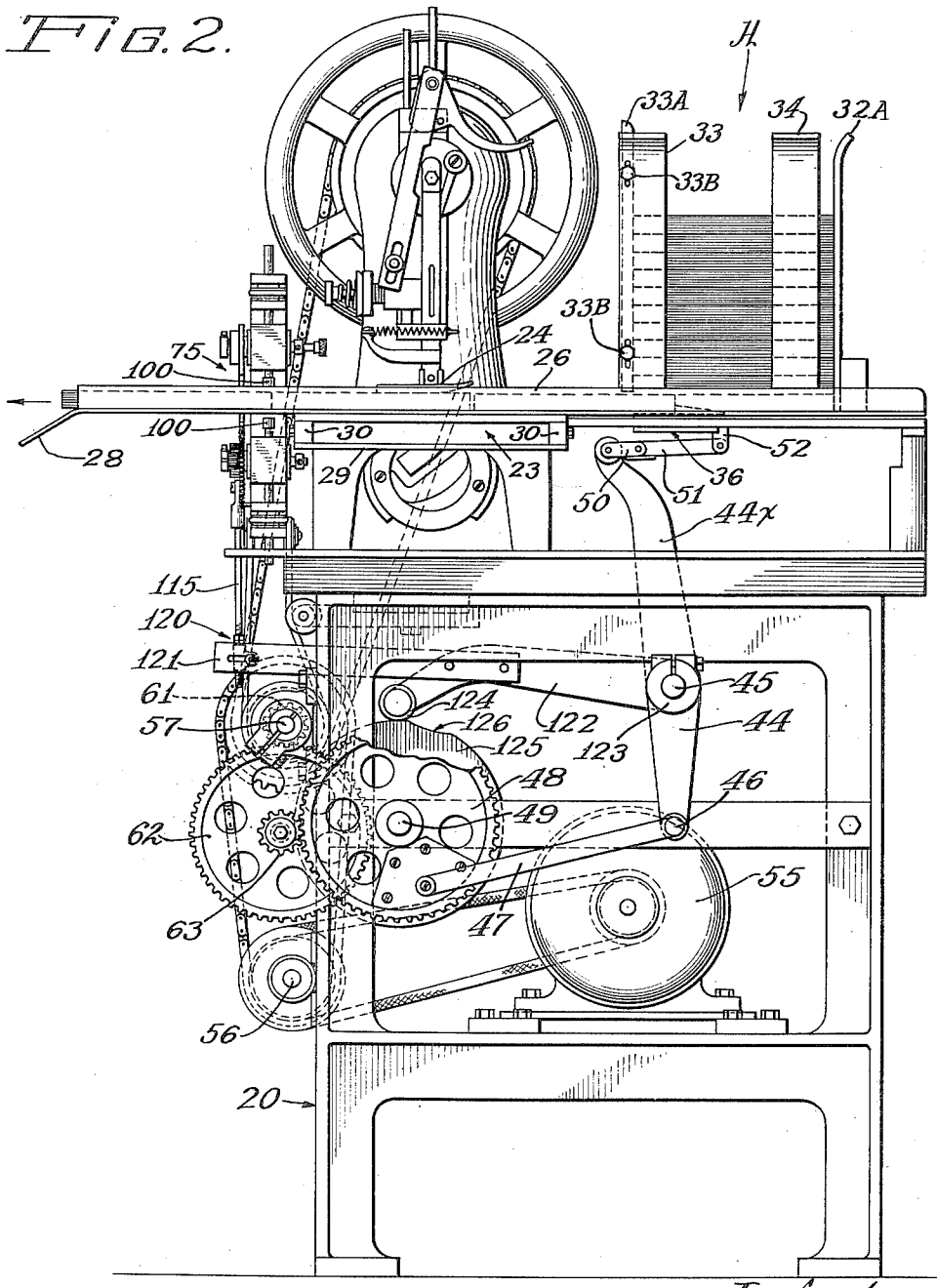
Inventor:
William B. Hildmann
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AUTOMATIC THREAD CUTTER AND REGISTER MEANS FOR BOOK SEWING MACHINES

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FIG. 2.



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AUTOMATIC THREAD CUTTER AND REGISTER MEANS FOR BOOK SEWING MACHINES

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Fig. 3.

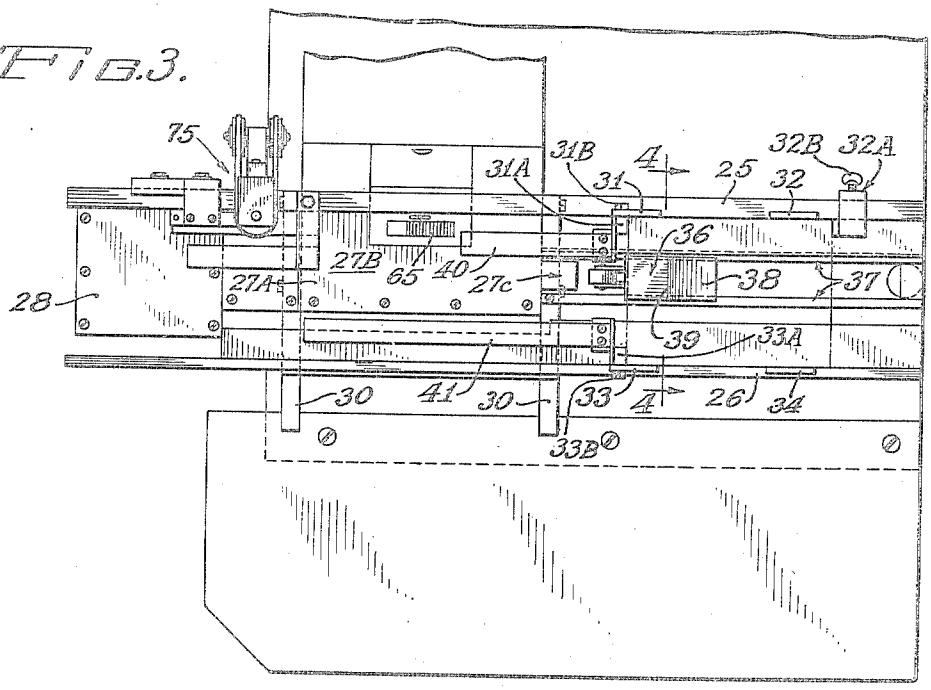


Fig. 4.

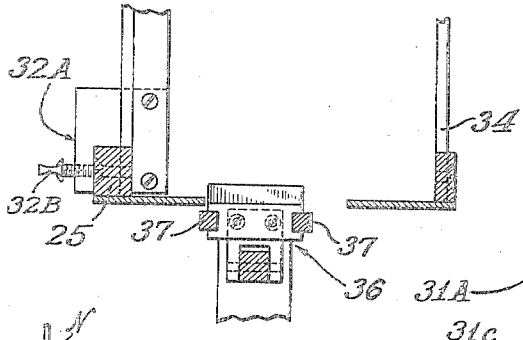


Fig. 5.

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AUTOMATIC THREAD CUTTER AND REGISTER MEANS FOR BOOK SEWING MACHINES

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Fig. 6.

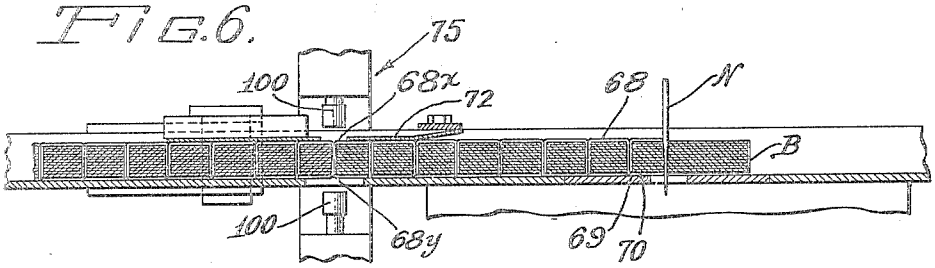


Fig. 7.

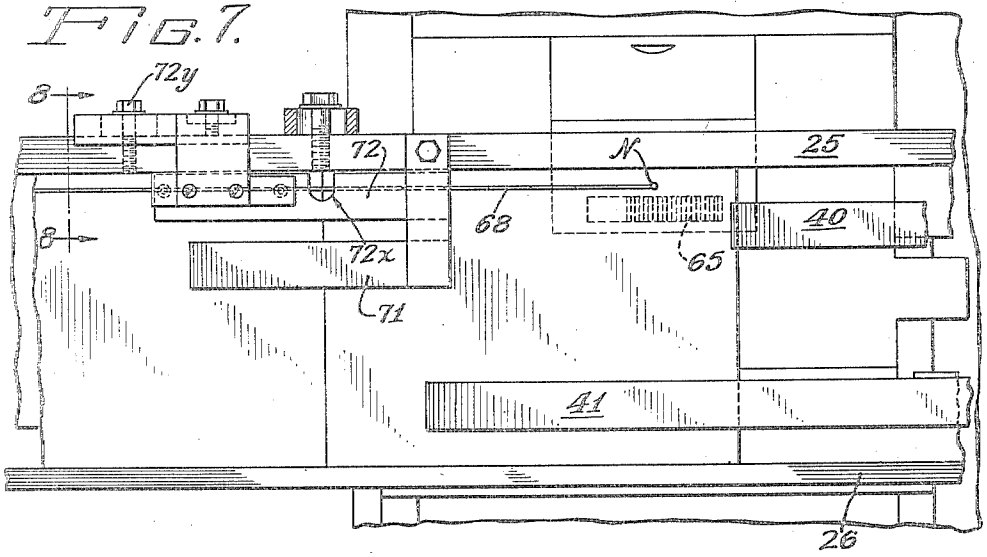


Fig. 8.

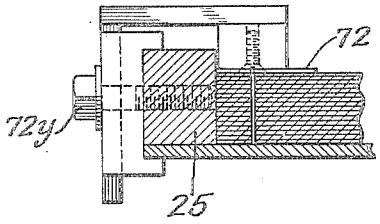
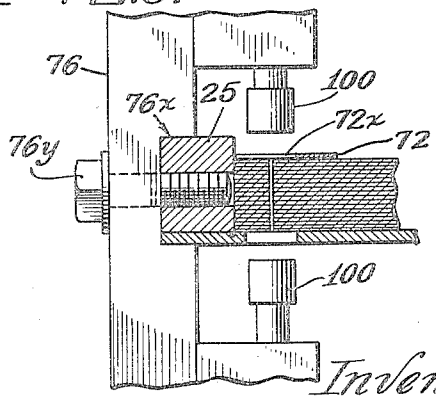


Fig. 9.



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FIG. 10.

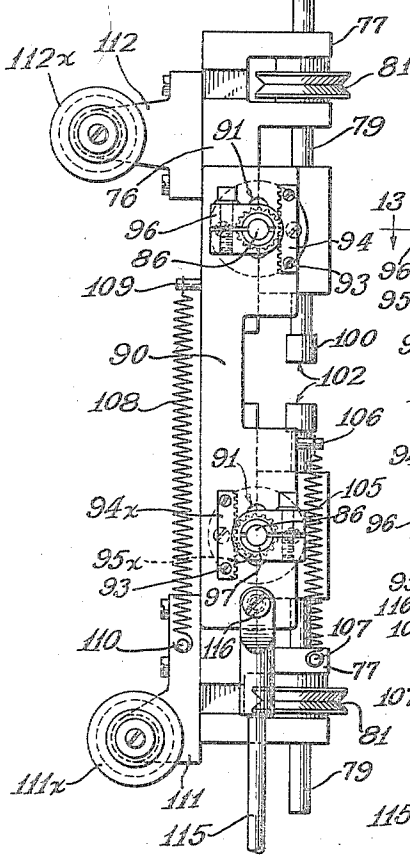


FIG. 11.

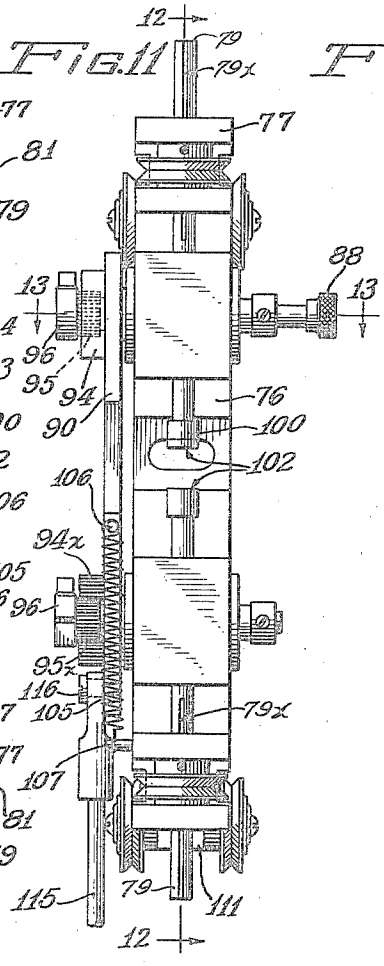


FIG. 12.

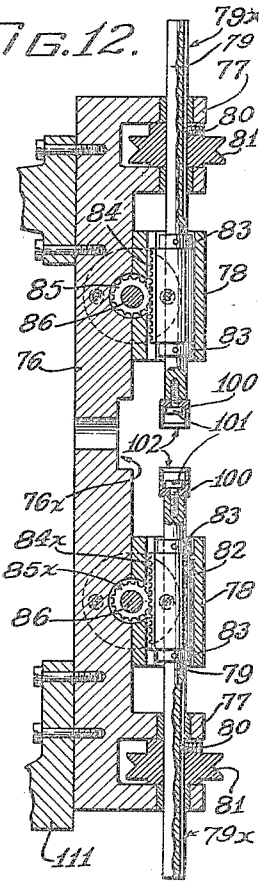


FIG. 13.

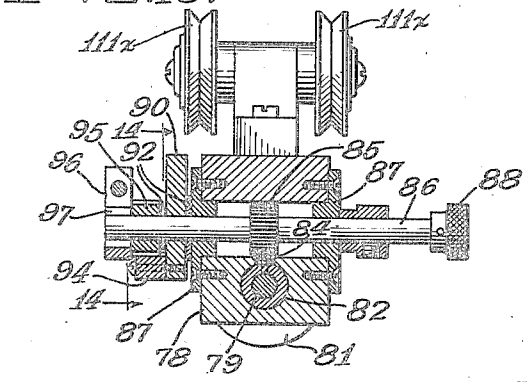
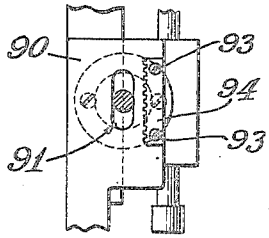


FIG. 14.



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Patented Jan. 31, 1950

2,496,211

UNITED STATES PATENT OFFICE

2,496,211

AUTOMATIC THREAD CUTTER AND REGISTER MEANS FOR BOOK SEWING MACHINES

William B. Hildmann, Chicago, Ill., assignor to Brock & Rankin, Chicago, Ill., a corporation of Illinois

Application June 8, 1944, Serial No. 539,340

25 Claims. (Cl. 112—252)

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This invention pertains to the bookbinding arts, particularly book sewing machinery, and has as one of its principal objects the provision of means for accurately feeding and registering books in a sewing machine, and for automatically cutting the running threads used in sewing book signatures, and the like, so that the individual books will issue from the machine unattached to each other, thereby eliminating the necessity of manually feeding and registering the books, and for manually cutting the threads, and increasing the productive capacity of the sewing machines, and additionally providing a closer and more accurately placed cut in the threading, by reason of which thread is saved, and the number of rejects resulting from carelessly made manual cuts and improperly registered stitches, is eliminated.

Heretofore, book signatures, gathered and stapled in book form, have been fed manually into known types of sewing machine employing a running lock stitch or other running stitch, which results in the sewn books emerging from the sewer in a connected train. The attendants who feed such machines require skill and judgment acquired by long training and experience in timing the feeding of the signatures in order that the stitching may start and end in proper relationship to the edges of the book, and in order that the books may follow each other as closely as possible to reduce the thread wastage. In accordance with prior practices it has been necessary for an attendant to cut the connecting threads as soon as the books issue from the machine; usually, two attendants are required; one for feeding, and one for cutting.

The device of the present invention accomplishes both cutting and feeding automatically and overcomes the problem of procuring exact register of the entering books at high speeds.

In accordance with the objects of the present invention, the feeding of the signatures is accomplished automatically with accurate timing and spacing of the books as they enter the sewing station, and the cutting of the running and locking stitch threads at the top and bottom of each book is likewise effected automatically, with the result that the books may be fed in very close succession, and the threading may be cut with complete accuracy, all at a greatly increased speed without losses or rejects, and with less thread.

Further and more detailed objects of the invention relate to the provision in a machine of the class described of hopper means into which the gathered signatures or books are stacked; to means for advancing the books one at a time

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beneath the sewing needle; to the provision of a novel cutter including upper and lower rotating cutting wheels adapted to grasp the sewn signatures therebetween at certain intervals and sever the threads at top and bottom quickly and completely; to the provision of drive mechanism for actuating the infeed, the sewing operations, and the cutting operations in accurately timed relation; to the provision of means for adjusting the machine to receive books of different size; to the provision of means in the cutter unit for automatic self-adjustment to variations in book thickness and similar irregularities.

Additional objects, aspects of novelty, and advantages peculiar to the invention relate to details of construction and operation of the embodiment described hereinafter in view of the annexed drawings in which:

Fig. 1 is a rear elevational view if the complete automatic sewing machine, showing the discharge side thereof;

Fig. 2 is a side elevation of the same showing the hopper and feed bed in which the books move from right to left;

Fig. 3 is a top plan view of the feed bed showing the infeed and cutter from above;

Fig. 4 is an enlarged vertical section through the feed bed and infeed means looking in the direction of lines 4—4 of Fig. 3;

Fig. 5 is a fragmentary vertical section through the hopper portion of the feed bed showing the feeding pawl;

Fig. 6 is an enlarged vertical section through the feed bed opposite the cutter unit;

Fig. 7 is an enlarged top plan view of the feed bed in the region of the cutting and sewing stations;

Fig. 8 is a magnified vertical sectional detail through the portion of the bed and a book therein adjacent the cutter, looking in the direction of lines 8—8 of Fig. 7;

Fig. 9 is a magnified sectional view similar to Fig. 8 showing the cutting wheels disengaged;

Fig. 10 is a side elevation of the cutting unit;

Fig. 11 is a front elevation of the cutting unit;

Fig. 12 is a vertical median section through the unit of Fig. 11, looking in the direction of lines 12—12;

Fig. 13 is a horizontal section through the cutter looking in the direction of lines 13—13 of Fig. 11;

Fig. 14 is a fragmentary side elevation of the cutter actuating plate looking in the direction of lines 14—14 of Fig. 13.

Referring to Fig. 1, showing the discharge

side of the machine, there is provided a frame 20 surmounted by a table portion 21 upon which is secured a standard type of book sewing machine 22, the construction and operation of which is known in the art and therefore need not be set forth in detail herein. The sewing machine 22 includes a shelf section 23 beneath its needle and presser foot 24 (see Fig. 2), the needle being concealed from view behind the presser foot.

A feeding bed for the books passes over the shelf 23 and includes a pair of side rails 25 and 26 and a bottom consisting of a plate 27 which terminates at its discharge or left end in a downturned apron 28, together with additional plate sections 27A (Fig. 3) and a plate member 27B having a slightly depressed tail 27C at the infeed end onto which the advancing books are pushed by the feeding pawl means to be described.

The books are stacked in a hopper generally indicated at H, Fig. 2, which is defined by uprights in rectangular array at the right-hand end of the bed. The arrangement of these uprights is best visualized in Fig. 3, wherein uprights 31 and 32 are secured to side rail 25, while uprights 33 and 34 are secured to rail 26.

Upright 31 includes a corner stop member 31A secured to main upright 31 for vertical adjustment by bolts 31B working in elongated slots (see also upright 33—33A in Fig. 1 for this construction). The purpose of having vertically adjustable corner stop sections 31A, 33A is illustrated in Fig. 5, and contemplates the passage of only one book at a time from the bottom of the stack by action of an ejector or pusher means 39, the bottom parts as at 31C always permitting only the bottom book to leave the hopper, upright members 31A, 33A being adjusted vertically for the thickness of the books.

The upright 32 includes a movable corner and back stop section 32A (Figs. 3, 4, 5) secured by a thumb screw 32B to slide along rail 25 to accommodate different lengths of book, the rail 26 being mounted to slide bodily away from rail 25 for adjustment to the width of the books by reason of its being adjustably secured on horizontal arms 30 (Figs. 1 and 3) by means of a clamp bar 29 (Fig. 1).

Means for advancing the books one at a time from the bottom of the hopper includes, in conjunction with the hopper structure heretofore described, a feeding pawl 36 (Figs. 4 and 5) having channeled sides which ride on track rails 37, there being an arcuate shoe 38 to slide beneath the stack on the back stroke of the pawl, the forward side 39 of this shoe engaging the edge of the book on the forward or advancing stroke to urge the book into the feeding bed, the books being held down in this movement by a spring presser foot 40 near rail 25, and another presser 41 near rail 26 (Fig. 3), only one book issuing at each stroke by reason of the construction of uprights 31—31A, 33—33A.

Means for reciprocating the feed pawl includes a rocker 44 (Fig. 2) on shaft 45 connected at its lower end 46 with a drive link 47 which in turn connects with a gear 48 on countershaft 49. The upper end of a second rocker 44X on shaft 45 connects through double links 50, 51 (Fig. 5 also), with a depending arm 52 on the pawl structure 36.

Power for driving the entire mechanism, as shown in Fig. 1, includes a motor 55 driving a countershaft 56, in turn driving a countershaft 57, from which power is taken off by a chain drive 58 for driving the flywheel 59 of the sewing machine; the cutter is also driven from

countershaft 57, as will appear. Another countershaft 60 is driven from shaft 57 through the agency of pinion 61 on the latter, and gear 62 on shaft 60. A pinion 63 fast with gear 62 drives the gear 48, which actuates the feed pawl rocker 44X through link 47, rocker 44.

On the infeed side, the books are advanced one at a time by pawl 36 into the bed at a time when the sewing needle N is down (see Fig. 5), the sewing machine feeding foot 24 being at this time elevated, and the advancing book engages the lowered needle as a stop, by virtue of which completely accurate register of the advanced book with respect to the needle and placement of the first stitch is accomplished. To this end, the timing of the drive means, heretofore described, for the advancing pawl 36, is calculated to effect the feeding of a book in step with the descent of the sewing needle after the last stitch in the preceding book. This descent of the needle after the last stitch is an idle stitch which occurs between any two succeeding books, and may be regarded as a registering stitch.

It will be apparent that upon the next descent of the presser foot 24, the first stitch will be taken in the newly advanced book, and from this time until the last stitch is taken, the book is under the control of presser foot 24.

The sewing needle N is situated behind the presser foot 24 and feeding pawl 65, and in conjunction with bobbin means (not shown) makes a running lock stitch, as illustrated in Figs. 6 and 7, that is, the main thread 68 runs along the upper side of the book B, as in Fig. 6, is carried through the book by the needle N, catches the bobbin thread 70 with a loop 69, and is carried to the next stitch by withdrawal of the needle and an advance of the book by action of the feed pawl 65. As the book advances to bring its trailing edge beneath the needle, another book form is fed by action of the infeed pawl 36, in such manner that the needle will fall upon the next succeeding book at a proper distance from the leading edge of such book, the threading, both main and bobbin, being carried over to the newly advanced book form, as indicated at 68X and 68Y in Fig. 6. Spring pressers 71 and 72 hold the book down in the bed in the region opposite the automatic cutting means, presently to be described, it now being apparent that two threads, one on the upper side of the book, and the other on the lower side, the bobbin thread, must be severed, and such severing or cutting must be effected quickly, positively, and at a closely limited margin with respect to each of the two books connected by the running thread.

The position of the automatic cutting means, generally indicated at 75 in Fig. 6, is preferably such that it will cut the threads connecting the last book to leave the needle N, and the book immediately preceding the same.

The novel cutting means comprises a compact unit such as illustrated in Figs. 10 through 12; it includes upper and lower cutting elements which are normally spring-urged to close together upon a book therebetween; the cutters are power driven and rotate at relatively high speeds; they are held open or in non-cutting position by mechanism actuated at proper intervals, as will appear, permitting them to close upon the book in cutting action.

Referring to Fig. 10, the cutter consists of a main arbor 76 (Fig. 12 also) having yokes 77 at its upper and lower ends, and spaced from each yoke is a corresponding bearing block 78; a cutter

spindle 79 is journaled in each pair of yokes and bearing blocks, each spindle having a keyway 79X in which works the nose of a set screw 80 of a corresponding pulley 81 so that the spindles may slide up and down in their bearings (Fig. 12).

Each spindle 79 is provided with a sliding bearing 82 carried in a corresponding bearing block, the spindles respectively being fitted with pairs of collars 83 which cause these bearings to move with the spindles, as will appear.

Each sliding bearing 82 is provided with a rack 84 (see also Fig. 13) adapted to mesh with an actuating pinion 85 carried on a corresponding rocker shaft 86 (Fig. 13) journaled in opposite bearings 87 secured to the arbor. The upper rocker shaft is fitted at one end with an adjusting knob 88, which, under certain conditions, may be turned to effect up and down motion of the corresponding cutter spindle through action of pinion 85 on rack 84, for purposes to appear.

Means for effecting simultaneous axial shifting of both cutter spindles includes an actuating plate 90 (Figs. 10 and 11) having upper and lower elongated solts 91 riding on the projecting ends of the two rocker shafts 86 between washers 92 (Fig. 13)

Fixed as at 93 (Figs. 10, 13, 14) is an actuating rack 94 or 94X, it being observed that the lower rack 94X is mounted on the side of the corresponding rocker shaft 86 which is diametrically opposite the side upon which the upper rack 94 is mounted with respect to its corresponding rocker shaft 86; this is to effect opposite movements of both cutter spindles 79 when the actuating plate is moved upwardly or downwardly; thus, when the actuating plate is moved upwardly, the upper cutter spindle will also move upwardly, but the lower spindle will move downwardly, by reason of the aforesaid opposite mounting of the actuating racks 94, 94X, each such rack meshing with a corresponding pinion 95 (Figs. 11, 13) which is adjustably secured to its corresponding rocker shaft by means of a split clamp 96 grasping the collar hub 97 (Figs. 10 and 13) of the corresponding actuating pinion.

Thus, by an upward motion of the actuating plate just described, the two cutter spindles will be caused to move away from each other, that is, to open, and a downward motion of the plate will cause the reverse action, or a closing of the cutters, through the agency of the associated rack and pinion drive means 84, 85.

As shown in Fig. 12, the cutters proper consist of hollowed cylindrical plugs 100 each secured removably by screw means 101 to the end of a corresponding cutter spindle 79, the confronting edges of these plugs being sharply ground to provide cutting edges 102.

Means normally and yieldably urging the two cutter spindles toward each other to closed condition includes a spring 105 anchored at its upper end to a pin 106 on the actuating plate, and at its lower end to a pin 107 on the arbor, together with a second spring 108 (Fig. 10) anchored at its upper end to a pin 109 on the actuating plate, and at its lower end to a pin 110 on a pulley block 111 secured to the arbor. These springs pull the actuating plate downwardly with the result that the two cutter spindles are moved toward each other to bring the cutters 100 into closer proximity, as into engagement with a book.

Means normally urging the actuating plate 90 into an upper position, to open the cutters, includes a shift rod 115 secured as at 116 at its upper end to a bottom region of the plate 90. With the entire cutter unit 75 mounted on the side rail 25 of the feed bed, as in Fig. 9, by having its arbor slot 76X fitted onto the rail and clamped thereto by bolt means 76Y, the shift rod 115 has its lower end secured adjustably in a clamp 120 carried on an arm 121 (Fig. 2) which in turn is fixed upon a rocker 122 floating as at 123 upon the rocker shaft 45 which reciprocates the book feed pawl 36, heretofore explained. Rocker 122 carries a cam roller 124 riding a cam 125 rotated by counter shaft 60 and including a drop 126 which permits the rocker 121 and hence the shift rod 115 to descend, under urgence of the springs 105 and 108, with a consequent closing together of the two cutters for cutting action upon the threads of the sewn book signatures.

The dwell and drop of the cam 125 is dimensioned in correspondence with the ratio of gears 48 and 63 and corresponding stroke of the book feeding pawl connecting rod 47 such that the closing together of the cutters as aforesaid will always occur when the confronting edges of the two books last sewn and joined by the running thread stand beneath the cutters as illustrated in Figs. 2 and 6, the feeding pawl 35 being actuated thereafter to push the next book under the presser foot 24 of the sewing machine.

The timing of the operation of the hopper feed pawl, as heretofore mentioned, is calculated to effect the advance of a book while the needle is down in its idle or registering stroke between successive books, in which position the needle is utilized as a registering stop for the advancing book; thereafter, however, the newly advanced book is under the control of the intermittent feeding cooperation of the presser foot 24 and the feeding pawl 65 of the sewing machine.

In this connection, the development of the cam 125 and the ratios of its associated driving means, which are also common to the sewing machine drive, are adjusted so that the cutters 100 descend quickly into and out of cutting position, under control of cam 125, at a time when the last stitch is being made in a book; more particularly, the timing of the descent of the cutters into cutting position is calculated to occur as the needle N goes down in the last stitch, for it is at this time that the book is standing still beneath the presser 24. As the needle goes up from this last stitch, so does the cutter shift rod 115, and cutters 100 move apart from the book. Meanwhile, another book is being advanced by the feeding means 36.

The length of the book is not important to the timing so long as the number of stitches per book is unchanged. Gears 62—63 may be changed if the number of stitches per book is changed; otherwise no adjustments are needed for the book size excepting in the hopper and rails 25—26. Cutting occurs after the last stitch in a predetermined number of stitches according to the ratios of gears 60 and 63.

In order to cut the threads positively, completely, and rapidly, the cutters are rotated at high speed by power taken from countershaft 57 at pulleys 130, from which a drive belt 131 is passed upwardly (Fig. 1) over idler pulleys 132, thence over pulley 111X (Fig. 10 also) over the lower cutter spindle pulley 81. Another drive belt 133 is passed upwardly over the idlers 132, upper pulleys 112X and cutter spindle pulley 81.

Operation

The machine is adjusted to take a given size of book by positioning rail 26 with respect to rail 25 according to the width of the book, which also adjusts hopper uprights 33—34. Hopper back

stop 32A is positioned on rail 25 according to the length of the book; and upright members 31A and 33A are adjusted vertically according to the thickness of the book.

The number of stitches is determined by selection of gear ratios for gears 62—63; the length of the stitch may be adjusted in the sewing machine in a known manner. The cutter unit 75 is positioned so that the cutters 100 will overlie the margin between two succeeding books, as in Fig. 6. To this end, it will be noted in Figs. 6, 7, 8, and 9 that the spring presser 72 is provided with a slot 72X (Fig. 7 particularly) through which the upper cutter descends onto the threading, and this presser may be aligned with the aforesaid margin between the books by loosening the bolt 72Y (Fig. 8 also) and sliding the presser to desired position. This presser may also be raised or lowered according to the thickness of the book while bolt 72Y is loose as aforesaid.

Gathered book signatures, usually held together in individual book form by staples, are placed in the hopper, as in Fig. 2, and after necessary adjustments, threading, etc., are made in the sewing machine, the power may be turned on, whereupon gear 48, driven through the means shown in Figs. 1 and 2 by motor 55, will actuate the rocker 44 and reciprocate the book feed pawl means 36, which will pass beneath the stack of books in the hopper and remove one book at a time therefrom and slide such book (toward the left, Fig. 2) under the presser foot 24 of the sewing machine against the lowered needle N (Fig. 5, dotted lines); thereafter presser 24 will descend urging the book down upon feed pawl 65, action of which intermittently advances the books after each stitch in the known manner.

When the first book sewn has passed from beneath the feeding pawl 65 of the sewing machine, it will be pushed by the next succeeding book until the adjoining edges of these two books are aligned with the cutters 100 at slot 72X (Figs. 6, 7, 9).

As the needle descends into the second book for the last stitch, drop 126 in cam 125 (Fig. 2) will pass beneath cam roller 124 causing rocker 122 and its projecting arm 121 to descend, thus permitting shift rod 115 to descend under urgence of springs 105 and 108 on the cutter unit to urge the actuating plate 90 downwardly; this causes the upper rack 94 (Fig. 10) to rotate its pinion 95 clockwise, thus causing pinion 85 to drive its rack 84 downwardly with a consequent shifting of the upper cutter spindle 79 downwardly, so that the upper cutter 100 descends upon the threading 68X (Fig. 6). At the same time, the lower rack 94X moves downwardly rotating its pinion 95X in an anticlockwise direction, which rotates the lower rocker shaft 86X similarly, causing its pinion 85X to drive the rack 84X upwardly, thus shifting the lower cutter spindle 79 and its cutter 100 upwardly against the undermost threading 68Y. As the needle rises from the last stitch, the dwell on cam 125 raises the means 124, 121, forcing the cutters apart by a reverse action of the cutter actuating plate from that just described.

Variations in thickness of the books are automatically compensated for by the closing action of springs 105 and 108. Adjustment for variation in the thickness of different sizes of books is accounted for by loosening the upper hub clamp 96 (Fig. 11) and turning knob 88 until the upper cutter is disposed at the proper level with respect to the thickness of the book.

The high-speed cutting efficiency of the annular cutters 100 makes it possible to adjust them (in the manner heretofore explained) so as to nip into the thread quickly without their being driven into the book or cloth tape (usually used along the stitching edges), it being appreciated that the cutting action against the strand is more positive than against the flat surface of the paper or cloth, as the case may be.

It will be understood that the novel cutting means may be employed with any registering means capable of coaction therewith to position the books or other objects properly for the cutting operation; and likewise, that the novel needle-stop registering means may be used with other types of thread cutter or other cooperation dependent upon accurate registration or positioning of the book or object relative to the needle.

The objects and advantages of the invention as herein specifically set forth for purposes of illustration, may be realized in modified forms without departing from the spirit and scope of the improvement, and no limitations upon the construction and operation of the invention are intended excepting as may be specifically set forth by the appended claims.

I claim as my invention:

1. Mechanism of the class described including means for sewing an object with top and bottom threading, means for feeding said object relative to said sewing means, cutters confronting opposite sides of said object and movable relative to each other and said threading, and means drivingly cooperating with said feeding means for automatically converging said cutters upon said threading at a time when said object is between the cutters and is not in motion under influence of said feeding means.

2. Mechanism of the class described comprising a sewing machine, means for feeding objects into sewing position in said machine, said objects being sewn thereby in succession connected by the sewing threading, cutting means including a rotary cutter movable toward and away from said object and the threading therein, and means for automatically moving said cutter into cutting engagement with said threading concurrently with the sewing of the last stitch by said machine in said object.

3. In a book sewing machine adapted to make a running stitch in a book and carry said stitch from book to book as books are fed therethrough, automatic cutting means including a rotary cutter, means mounting said cutter for movement toward and away from a sewn book in said machine, means rotating said cutter, means yieldingly urging said cutter into engagement with a sewn book as aforesaid, actuating means normally holding said cutter out of cutting relationship with a sewn book against the urgence of said means yieldingly urging the cutter, and means operating in timed relation to the sewing action of said sewing machine for operating said actuating means to effect movement thereof causing said cutter to engage the stitching in a sewn book by action of said yieldable urging means at a time during the formation of the last stitch sewn in a book and in the region of the first stitch in said book.

4. In a book sewing machine of the type adapted to form a running lock stitch in a book and to carry said stitch from a sewn book to a book to be sewn, together with means for advancing a book after completion of each stitch by the needle, automatic stitch cutting means includ-

ing a pair of cutters mounted for movement toward and away from each other, means yielding urging said cutters toward each other, means for moving said cutters in cutting action independently of the first-mentioned movement thereof, means mounting said cutters as a unit for positioning in said machine at a point with said cutters aligned respectively above and below the connecting stitch between successively sewn books, cutter actuating means normally moving said cutters away from each other out of cutting relation with sewn books as aforesaid against the action of said yieldable urging means, and cutter control means acting in timed relationship with said advancing means for operating said actuating means to permit movement of the cutters by said yieldable urging means into cutting relation with stitching as aforesaid at a time when said needle is in the course of forming the last stitch in a book.

5. The invention set forth in claim 4 further characterized by the provision therein of means for feeding books one at a time into a position of register for engagement by said advancing means, and drive mechanism actuating said feeding means, said advancing means, and said cutter control means in a predetermined timed relationship.

6. Book sewing mechanism comprising a feed bed, means for advancing books one at a time into said bed, means for sewing books in said bed with threading that is carried from one sewn book to the next, means for advancing a book intermittently in conjunction with the sewing operations effected by said sewing means, a thread cutter operable upon sewn books in said bed and positioned to cut the threading at a point between the trailing and leading edges of successively sewn books, said cutter being movable into and out of cutting relationship with threading as aforesaid, actuating means for moving said cutter into and out of cutting relationship as aforesaid, and control means for operating said actuating means to effect movement of the cutter into cutting relationship with the threading at intervals operatively correlated with the operation of said advancing means.

7. The combination with a book sewing machine of the type having means adapted to advance a book intermittently in timed relation to the sewing movements of a sewing needle operating upon said hook and to carry the threading from one sewn book to the next succeeding book, of thread cutting means comprising: convergently movable cutters mounted to engage said threading in the region adjacent the confronting edges of succeeding books by convergent movement toward said books and against the threading thereon, means normally disposing said cutters out of cutting position relative to said threading, means for moving said cutters in timed cooperation with means for advancing books as aforesaid into cutting relation with said threading, and means for effecting convergent movement of the cutters into cutting relation with the threading at a time prior to the advance of a book by the machine as aforesaid after a last stitch has been made in a said succeeding book.

8. The combination of claim 7 further characterized in that said cutters are rotatable in addition to being convergently movable, and there is additionally provided means for rotating said cutters independently of other said movements thereof.

9. The combination of claim 7 further characterized by the provision therein of spring means normally urging said cutters convergently into cutting position, means for urging said cutters away from cutting position in opposition to the effort of said spring means, and means operable at intervals timed predeterminately in respect to intermittent advancing movements of a book by the sewing machine as aforesaid for rendering said last-mentioned urging means ineffective to oppose the action of said spring means in urging the cutters into cutting position.

10. In a book sewing machine of the type adapted to make a running stitch carried from book to book and connecting succeeding books passed therethrough one at a time with stitching appearing on opposite sides of each book, thread cutting means including, namely: a pair of rotatable cutters disposed on opposite sides of a said book and movable convergently upon the stitching at the corresponding sides of a book to cut said stitching, and means for effecting convergent motion of the cutters against said stitching when the connecting stitching between successive books is disposed in alignment with said cutters.

11. In combination, a book sewing machine including a reciprocable sewing needle, and automatic feed means including a book hopper, means actuated in timed relation to the reciprocations of said needle for effecting removal of one book at a time from said hopper and advancing the same against said needle at a time when the latter is in a lowered position whereby to accurately register said book for sewing by said needle, and feeding means engageable with said registered book for moving the latter in sewing action after advance against the needle as aforesaid.

12. In a sewing machine, a hopper for articles to be sewed, means for ejecting an article from said hopper and advancing the article to a sewing station, a sewing needle movable in sewing action into and out of position across the path of movement of articles advanced as aforesaid, means for advancing said articles in sewing movements with respect to said needle from said station, and means driving said ejecting and advancing means and said needle, together with said second-named advancing means, in timed relation such that said articles will be advanced to said station against said needle at a time when the latter is positioned across the path of movement of articles as aforesaid.

13. In a sewing machine, a vertically reciprocable needle, an article hopper, means for ejecting one article at a time from said hopper and advancing the same toward said needle, a second advancing means for moving said article in sewing action with respect to said needle after delivery of the article by advance as aforesaid to a predetermined position adjacent said needle, and means driving said ejecting and advancing means, said needle, and said second advancing means in timed relation such that an ejected article will be advanced by said first advancing means against said needle when the latter is in a lowered position, and thereafter said article will be advanced by action of said second advancing means.

14. In a book sewing machine, in combination, a feed bed, means for advancing books along said bed, a sewing member engageable with a book in said bed, drive means actuating said advancing

means and said sewing member in timed relation such that a book is advanced to a position of register determined by contact with said sewing member, thread cutting means positioned adjacent said bed in a direction away from the sewing member in the direction of advance of said books, and means coacting with said drive means to actuate said cutting means in cutting operation at a predetermined point along the sewn part of a book intermittently following a predetermined number of sewing operations of said sewing member on said book.

15. In a book sewing machine, in combination, a vertically reciprocable sewing needle, means for advancing a book from a predetermined position toward and against said needle at a time when the latter is in a lowered sewing position to register said book, means for advancing said book in sewing movements relative to said needle from said position of register, and cutting means reciprocable into and out of cutting relation with a sewn book in a direction substantially normal thereto at a cutting station to which said book is advanced by said second-mentioned advancing means, means normally urging said cutting means into a non-cutting position, and means for urging said cutting means into cutting position relative to a book at said cutting station following a predetermined number of reciprocations of said needle.

16. In a machine of the class described, rotary thread cutters movable convergently, means for effecting movement of thread-bearing articles between said cutters, means urging said cutters apart to receive said articles therebetween, means for simultaneously converging said cutters in a direction upon said articles and the thread thereon when the latter are at a predetermined position of travel but at rest with said cutters working in a direction against said article therebetween with respect to said cutters but at rest with said cutters working in a direction against said article therebetween and the thread thereon, and mechanism actuating the aforesaid means in timed relation for the purposes and in the manner set forth.

17. The invention of claim 16 further characterized by the provision therein of means for imparting a rotary cutting motion to said cutters concurrently with said converging action thereof, at least.

18. The invention of claim 16 further characterized by the provision therein of means normally and yieldingly urging said cutters in a convergent sense upon said articles and restrained by action of said means for urging the cutters apart, such that when the cutters converge simultaneously as aforesaid, they are automatically self-adjusting to variations in thickness of the articles therebetween by reason of the yieldability of said urging means.

19. A cutter comprising members movable in axial alignment toward and away from each other, cutters carried at adjacent ends of said members, rack and pinion means for moving the members as aforesaid, and mechanism for periodically moving said members to converge said cutters upon an article to be cut and for moving said members apart from said article.

20. The invention defined in claim 19 further characterized in that said mechanism for moving the members periodically includes means normally and yieldingly urging said members in a convergent sense and means acting periodically to force said members apart against the action of said yieldingly urging means.

21. In sewing machines and the like of the type in which articles are fed in succession past a sewing means movable crosswise of the path of feeding movement of said articles, improvements comprising, namely: registering means for assuring feeding of an article always into a predetermined starting position relative to said sewing means, and including an article feeder moving said articles toward said starting position, and adjustable drive means for said feeder acting cooperatively in timed relation to sewing movements of said sewing means such that an article will be advanced by said feeder against said sewing means as a stop register at a time when said sewing means is disposed crosswise of the feeding path aforesaid.

22. Cutter mechanism comprising a pair of rotatable cutters mounted for convergent and divergent movement upon substances to be cut positioned therebetween, means for converging and diverging said cutters, and means driving said cutters in rotary motion.

23. In a sewing machine, a reciprocating needle, at least two means for feeding objects in succession relative to said needle, a first one of said feeding means moving said objects in succession, serially, from a feeding station to a predetermined station adjacent said needle, said second feeding means being situated to engage an object at said station and fed thereto by action of said first feeding means, and to effect a further feeding movement of the said object beneath said needle cooperative with sewing movements of the latter, said second feeding means further moving the sewn object away from said needle, and mechanism coordinating the operation of said needle and said first and second feeding means such that said needle is fully advanced in direction of sewing movement at times when an object is fed to said station by the first feeding means as aforesaid so that said needle is operated in an idle motion between succeeding objects fed as aforesaid and such that the feeding operation of said first means is fully completed for each object fed thereby at a time when said needle is fully advanced in idle feeding movement as aforesaid.

24. In a booksewing machine of the type including a reciprocable sewing needle, improvements comprising a bed for feeding books serially toward said needle; a reciprocable feeding pawl for advancing books from an infeed station to a predetermined position along said bed; means for feeding a supply of books to said infeed station for engagement one at a time and advance as aforesaid by said feeding pawl; said machine further including a known presser pawl feed means for seizing books at said predetermined position and feeding the same beneath said needle coordinately with sewing movements of the needle; and means reciprocating said feeding pawl in timed coordination with movements of said needle and said presser pawl feed such that the serially leading book advanced by said feeding pawl along said bed will be stopped with its leading edge closely confronting said needle at a time when the latter is lowered in an idle sewing stroke between a sewn book and the next succeeding book to be sewn, said last-mentioned coordinating reciprocating means further operating to retract said feeding pawl in the next successive feeding reciprocation only after said needle has begun a true stitch in the book previously advanced thereby to said predetermined

position and said presser pawl feed means has seized the book in which said true stitch is begun as aforesaid, whereby the first true stitch in each book fed as aforesaid is registered accurately relative to the leading edge portion thereof.

25. In a sewing machine of the type having a reciprocable needle moving in timed relation to a cooperating presser feed pawl such that the latter is raised to receive an object to be sewn therebeneath at a time when said needle is substantially fully advanced in sewing action in a direction through said object, improvements comprising: infeed and registering means including a reciprocable feeding member operating to advance objects in succession from an infeed station to a registering station adjacent said needle and presser feed pawl with the leading edge portion of said object closely registered with said needle, and drive mechanism including a motor and timing means drivingly interconnecting said motor with said sewing machine and said reciprocable feeding member for coordinated action such that objects of a predetermined size will be fed by advance as aforesaid to said registering station with the leading edge of a leading object fully arrested in close proximity to said needle at a time when the latter is fully advanced in

sewing action as aforesaid with said presser feed pawl raised and said leading edge disposed beneath said presser feed pawl to be seized by the latter with the next sewing movements of said needle, said reciprocable feeding member having fully completed all object-advancing motion at a time when said needle is in fully-advanced registering position as aforesaid, and means for adjusting said drive mechanism to maintain the aforesaid coordinated action for objects of different size.

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