May 12, 1931. R. E. ACKLEY 1,805,157

BOOKBINDING MACHINE

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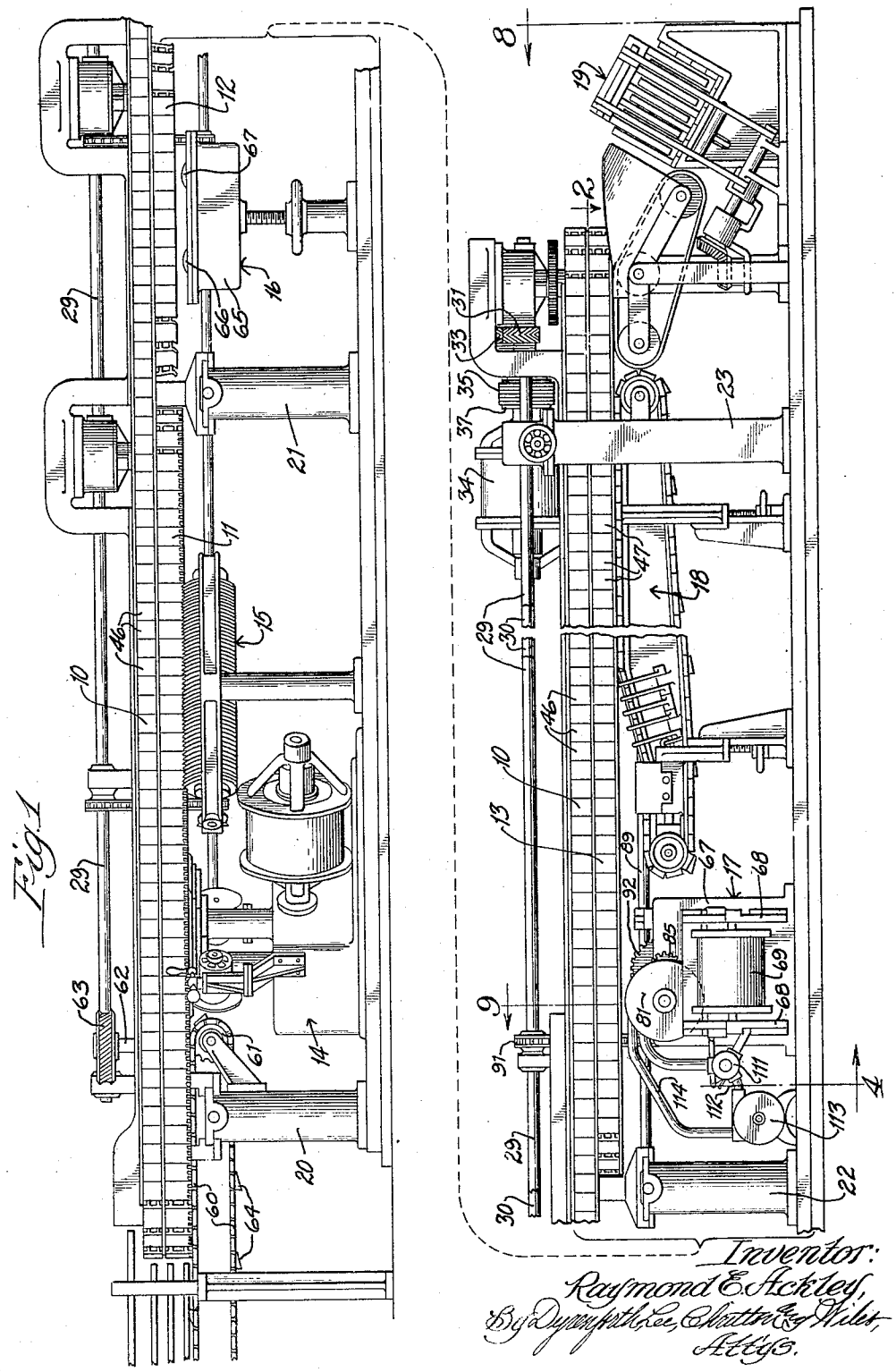


Fig. 1

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Fig. 3

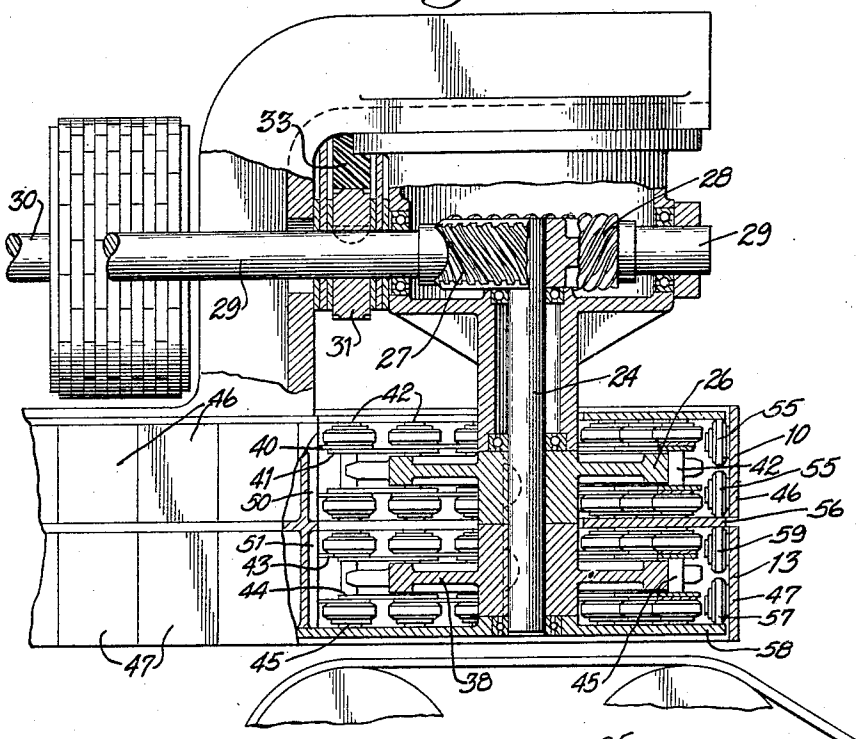
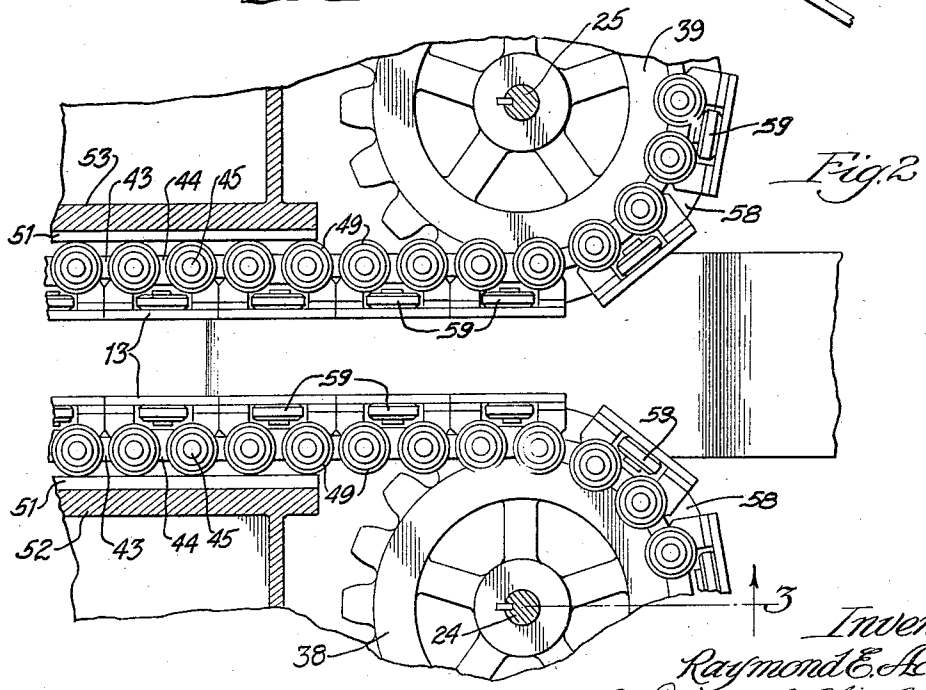


Fig. 2



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BOOKBINDING MACHINE

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Fig. 4

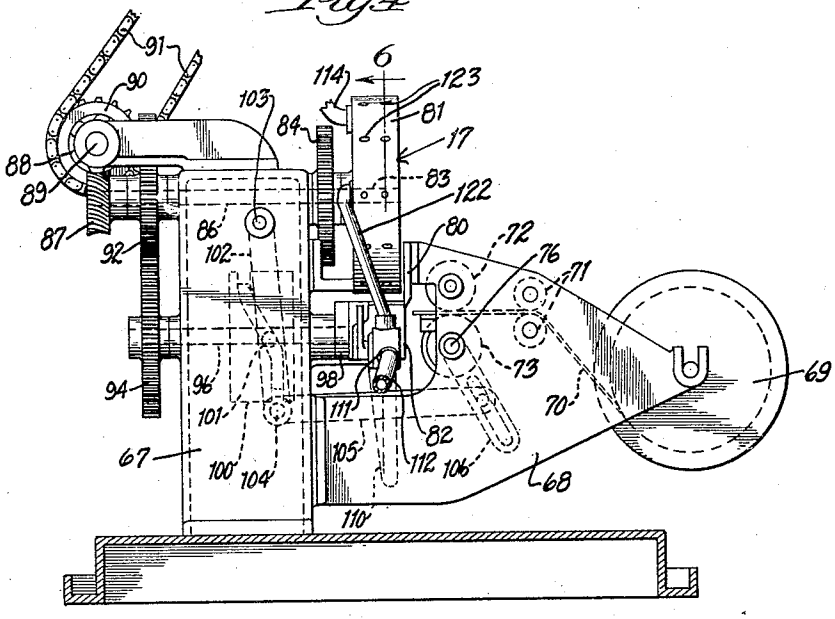
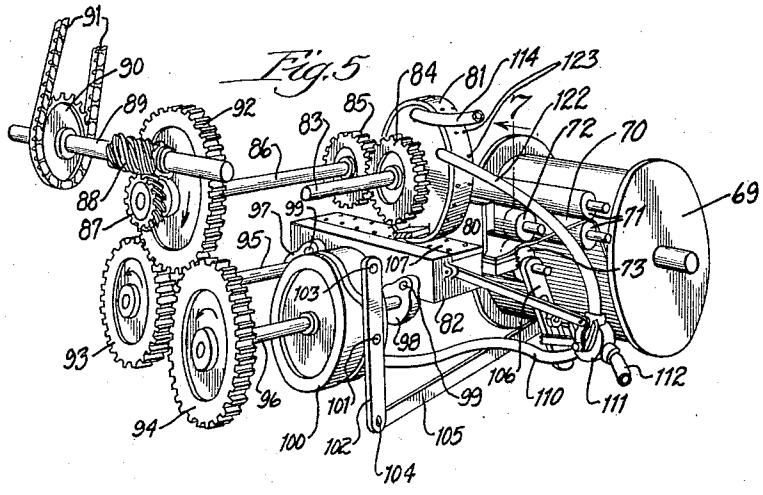


Fig. 5



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Fig. 6

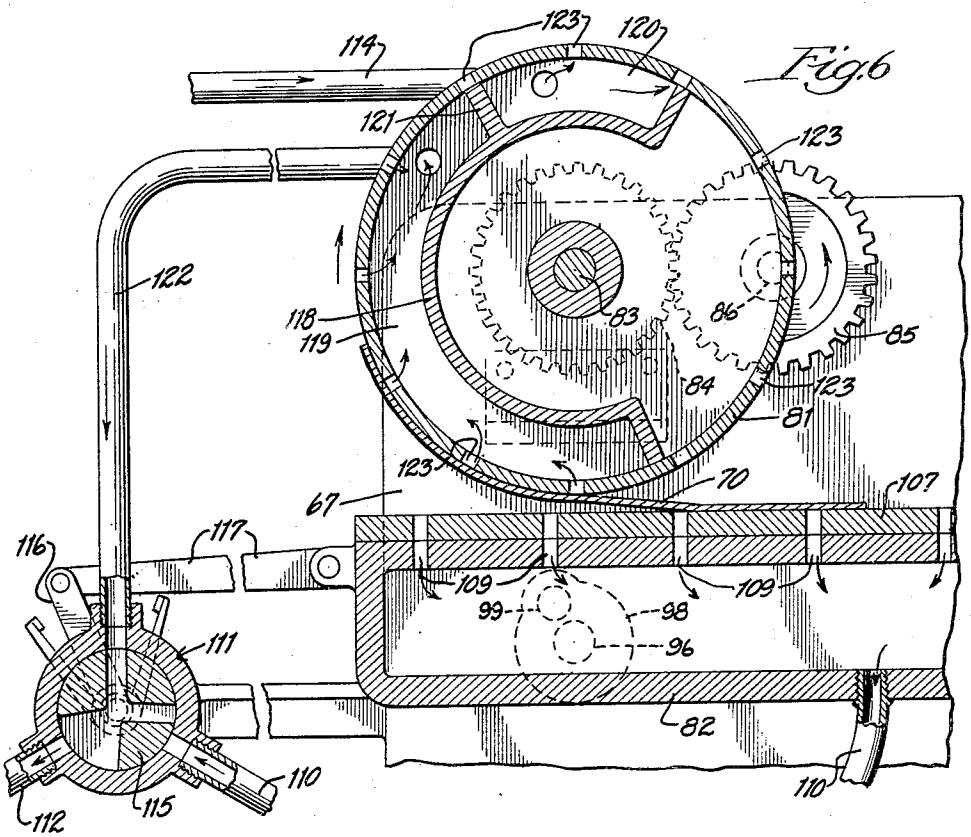
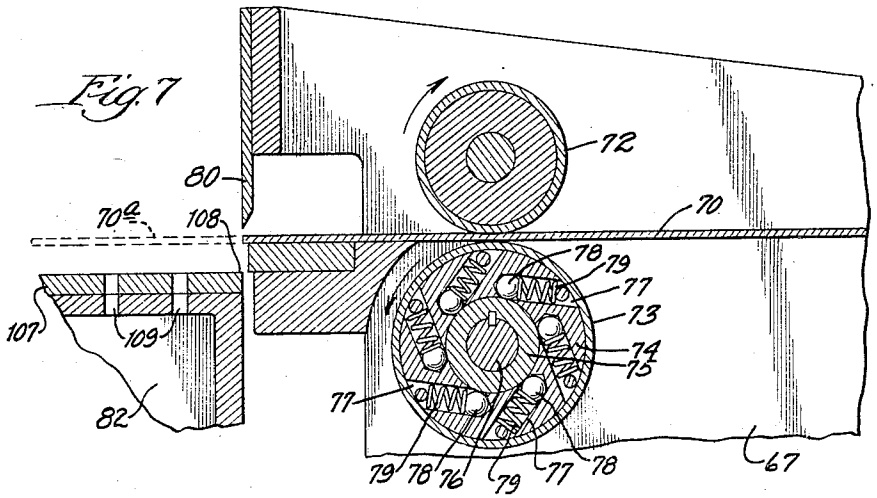


Fig. 7



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BOOKBINDING MACHINE

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Fig. 8

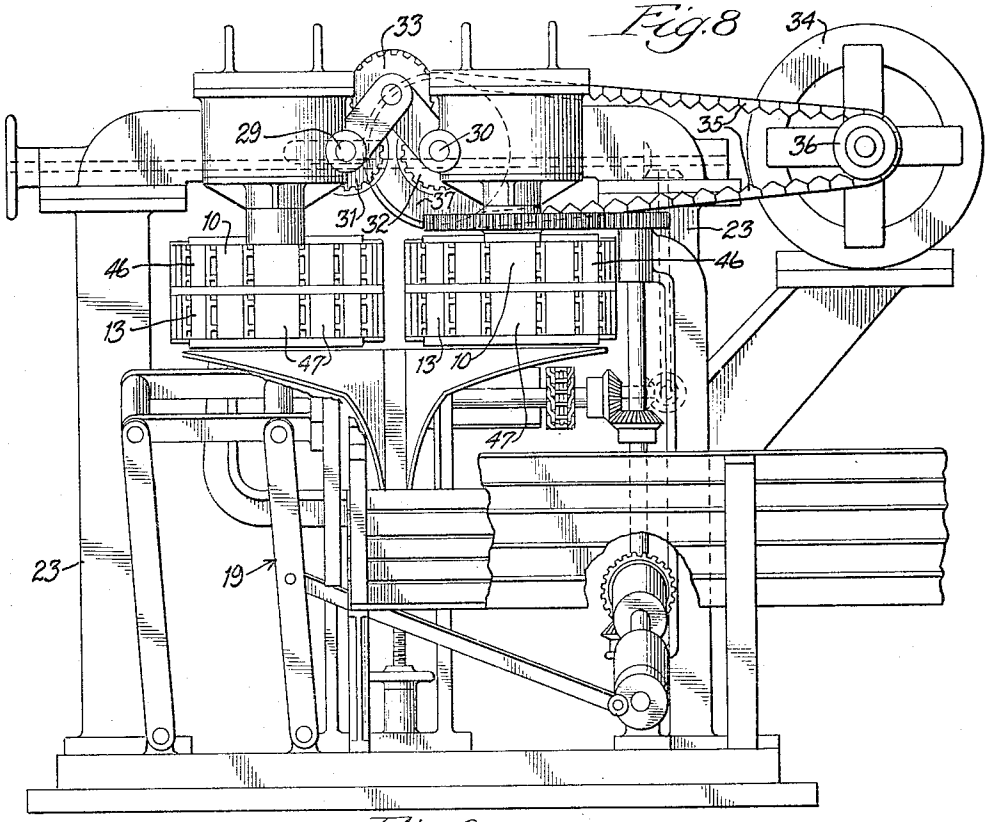
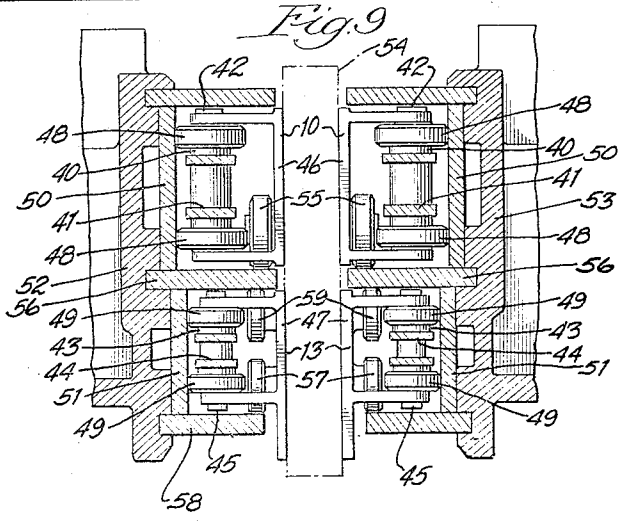


Fig. 9



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Patented May 12, 1931

1,805,157

UNITED STATES PATENT OFFICE

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BOOKBINDING MACHINE

Application filed June 10, 1929. Serial No. 369,862.

This invention relates to bookbinding machines employing as an element thereof, mechanism for applying supers to the assembled signatures fed to said mechanism.

My primary object is to provide improved means for applying supers to the grouped signatures.

Referring to the accompanying drawings:

Figure 1 is a view in side elevation of a bookbinding machine embodying my improvements.

Figure 2 is an enlarged broken plan section taken at the line 2 on Fig. 1 and viewed in the direction of the arrow.

Figure 3 is a view in side elevation of the mechanism shown in Fig. 2, a portion thereof being broken away and certain parts shown in vertical section, the section being taken at the line 3 on Fig. 2 and viewed in the direction of the arrow.

Figure 4 is an enlarged section taken at the line 4 on Fig. 1 and viewed in the direction of the arrow.

Figure 5 is a perspective view showing the operative parts of the super-applying mechanism.

Figure 6 is an enlarged section taken at the line 6 on Fig. 4 and viewed in the direction of the arrow.

Figure 7 is an enlarged broken section taken at the line 7 on Fig. 5 and viewed in the direction of the arrow.

Figure 8 is an enlarged view in end elevation of the machine as viewed on the line 8 of Fig. 1; and

Figure 9, an enlarged broken section taken at the line 9 on Fig. 1 and viewed in the direction of the arrow.

The particular illustrated machine comprises a conveyor 10, formed of a pair of endless chains arranged side by side and preferably extending throughout the length of the machine and which grips the upper portions of a book which is fed to it at one end and retains this same grip upon the book until it is discharged at the opposite end. This leaves the lower, or unsupported, end of the book free to be grasped by other conveyors represented at 11, 12 and 13 arranged in series lengthwise of the machine directly below the conveyor 10 and which assists in performing various operations upon the book.

In the machine shown the conveyor 11 holds the lower edge of the book firm while it is being trimmed by trimming mechanism represented at 14, (Fig. 1) and also while a transverse notch or groove is produced therein by means of a rotary saw device 15 as shown and described in my application above referred to.

The conveyor 12 operates to "fan" the lower cut portion, or back-edge, of the book to one side so as to expose overlapping edges of the sheets to gluing mechanism represented at 16 (Fig. 1).

The conveyor 13 is provided for holding the lower portion of the book again in a flat position while a "super" is applied thereto by the mechanism 17 in accordance with my present invention and as hereinafter fully described; the conveyor 13 also holding the lower portion of the book while a cover is applied to the back of the book and firmly pressed thereagainst by means of mechanism represented at 18 following the operation of which the book passes out through the chute at the end of the machine to cross-feeding mechanism 19.

The two endless elements comprising the long conveyor 10 are carried by a suitable frame supported on the standards 20, 21, 22 and 23, and engage, at opposite ends of the machine, with horizontally disposed sprockets keyed to vertical shafts. These shafts at the tail end of the machine are represented at 24 and 25 (Fig. 2) and the sprocket referred to on shaft 24, at 26 (Fig. 2).

The shafts 24 and 24 are provided at their upper ends with worm wheels, the one on

shaft 24 being represented at 27 (Fig. 3) which mesh, respectively, with worms, the one meshing with the worm wheel 27 being shown at 28, on shafts 29 and 30, which are carried in suitable bearings on the main frame and which extend substantially the full length of the machine.

The shafts 29 and 30 are operatively connected together by means of gears 31 and 32 (Fig. 8) of the same size provided on these shafts and meshing with an idler gear 33, whereby the shafts 29 and 30 are caused to rotate in the same direction and at the same rotative speed.

The shafts 29 and 30 are driven by a motor represented at 34, (Fig. 8) through a belt connection 35 between pulleys 36 and 37 on the motor shaft and the shaft 30, respectively.

The conveyor 13, likewise formed of a pair of endless chain elements, is located directly beneath the conveyor 10, both of the endless elements of conveyor 13 operatively engaging at each end with a sprocket. The sprockets for the conveyor 13, at the tail end of the machine are represented at 38 and 39 these sprockets being keyed to the vertical shafts 24 and 25, respectively, the conveyor 13 thus operating at the same speed as the conveyor 10.

The conveyors 11 and 12 are also driven from the shafts 29 and 30 at the same speed as the conveyor 10 and the chain element of each conveyor 10, 11, 12 and 13, at one side of the longitudinal axis of the machine, together with their operating shaft 29, are adjustable crosswise of the machine for adapting them to operate on books of different thicknesses.

The endless chains of the various conveyors are formed of links pivotally connected together by means of pins. The links of the conveyor 10 are represented at 40 and 41 (Fig. 3) and their connecting pins at 42. The links for the conveyor 13 are represented at 43 and 44 and their pins at 45. The conveyors 10 and 13 also comprise facing links 46 and 47, respectively, likewise mounted upon the pins 42 and 45, respectively, and at which the conveyors grip the books for feeding them through the machine. The pins 42 and 45 have rollers 48 and 49, respectively, mounted thereon which are adapted to roll upon back plates 50 and 51, respectively, carried by frame members 52 and 53. Thus the pressure of the book, represented at 54, shown in Fig. 9, is taken by the facing links referred to and transmitted through the pins and rollers thereon to the plates 50 and 51. Each link 46 is provided with a roller 55 which runs upon a horizontal member 56 (Fig. 9), the member 56 being firmly held by the frame members 52 and 53. Each link 47 of the lower conveyor 13 is provided with a roller 57 which rolls upon a lower, horizontal, member 58; and with an upper roller 59 adapted to bear upwardly against the member 56 in case upward pressure is exerted against this lower conveyor.

The endless chains of the other lower conveyors 11 and 12 are preferably constructed as described of the conveyor 13 and are associated with channeled members serving as a backing and guiding means for the chains, as described of the conveyor 13.

In the machine shown, books are fed to the bookbinding machine by means of a conveyor belt 60 (Fig. 1) which passes over a sprocket 61 driven by means of gears, (not shown), from a shaft 62 which has a worm wheel 63 driven by a worm on the shaft 29. The belt 60 has a series of lugs 64 which feed the book to the conveyor chains 10 in definite timed relation thereto so that the books are always in step with the several mechanisms of the bookbinding machine, particularly the "super" feeding mechanism 17.

It will be understood that the book, on entering the machine, becomes engaged near its upper part by the endless chains of the upper conveyor 10 which operate to retain a firm grip upon the book throughout its travel through the machine.

The gluing mechanism 16 comprises a glue-pot 65 (Fig. 1) containing roller means preferably formed of two rollers 66 arranged in line lengthwise of the machine and journalled to extend at their lower portions into the glue, these rollers being so positioned that in the lengthwise movement of the book by the conveyor mechanism referred to the lower edge of the book is engaged by the peripheries of these rollers to apply glue thereto, the facing links of the conveyor 12 being preferably laterally deflected in the same direction to cause the sheets of the book at its lower edge portion to become fanned before reaching the gluing mechanism and while moving in engagement with the peripheries of the gluing rollers, as more specifically described in my said above entitled application.

Referring now to the super-feeding mechanism 17 (Figs. 1, 4, 5, 6 and 7) and which operates on the books after the gluing operation referred to, it comprises a frame 67 (Fig. 4) provided with a bracket 68 on which is journalled a reel 69 having spirally wound thereon a band of loosely woven material 70 commonly called "super" which is to be placed upon the glued back of the book and between it and the cover applied to the book by the mechanism represented at 18, the "super" material 70 passing between rollers 71 and thence between feed rollers 72 and 73.

The feed roller 73 (Fig. 7) comprises an outer sleeve which is mounted upon a core 74, the latter being journalled upon a sleeve 75 which is keyed on a shaft 76. The core

74 contains a series of tangentially arranged openings 77 in each of which is located a steel ball 78 which is pressed toward the sleeve 75 by means of a spring 79. As the shaft 76 and sleeve 75 are oscillated, as later will be explained, the sleeve 75 engages the balls 78, when this sleeve is rotated in counterclockwise direction in Fig. 7, thereby advancing the roller 73 and the "super" fabric 70. As the sleeve 75 returns, in clockwise direction, the balls 78 are rolled back out of pressure-contact with the sleeve 75 so that the roller 73 is advanced only during counterclockwise movement of the sleeve 75.

The "super" 70 on being fed forward, passes under a stationary knife 80 (Fig. 7) and a revolving drum 81 (Fig. 6), and over a hollow box 82. The drum 81 is mounted upon a shaft 83 (Fig. 5) upon which is keyed a gear 84 which meshes with a gear 85 on a shaft 86. The shaft 86 is driven by means of a spiral gear 87 which meshes with a spiral gear 88 on a shaft 89. All of these shafts are journalled in suitable bearings carried by the frame 67. The shaft 89 has a sprocket 90 keyed thereon which is driven by means of a chain 91 from a sprocket on the shaft 29.

The shaft 86 carries a gear 92 which meshes with gears 93 and 94 by which the shafts 95 and 96 are driven. The shafts 95 and 96 carry parallel cranks 97 and 98 having pins 99 which are journaled in a side of the hollow box 82 so that the latter is given circular motion, the top always remaining horizontal.

The shaft 96 carries a cam 100 in which operates a cam follower 101. The cam follower 101 is carried by a lever arm 102 which is pivotally mounted at 103, the movable end of the lever 102 being connected by means of a pin 104 with a link 105, the opposite end of this link being pivotally connected to a lever 106 which is keyed to the shaft 76.

It will be understood from the foregoing that on each revolution of the shaft 96 the cam 100 acting through the lever 102, the link 105, the lever 106, and the ratchet mechanism shown in Fig. 7, advances the "super" fabric 70 from the position shown in Fig. 7 in full lines, to the dotted line position 70^a. At this time the hollow box 82 is in a position which will permit the super 70 to be fed beneath the knife 80. The upper portion of this hollow box carries a hardened metal top 107 having a shearing edge 108 which, on its next upward movement, passes the shearing edge of the knife 80 and serves to shear off the portion 70^a of the "super". The strip thus severed falls upon the metal top 107 and is then controlled by suction apparatus which will now be described.

The hollow box 82 contains a series of openings 109 (Fig. 6) this box being connected by means of a flexible hose 110 with a three-way valve 111 which, in turn, connects through a pipe 112 with a pump 113 (Fig. 1). This pump is driven by any suitable means and has an outlet 114 while the pipe 112 is an intake.

The three-way valve 111 has a plug 115 which has a lever arm 116 connected to the hollow box 82 by means of a link 117. Thus as the hollow box 82 is oscillated back and forth by means of the pins 99, the passages in the plug 115, in one position of the plug, connect the intake pipe 112 with the hose 110 so that suction of the pump 113 acting through the openings 109 in the hollow box 82 serve to hold the strip of "super" on the top of the hollow box which then moves to carry this strip of "super" adjacent the bottom of the revolving drum 81.

The drum 81 (Fig. 6) is provided with a stationary partition 118 which forms a compartment 119 the end of which overlies the end of the hollow box 82. The second compartment 120 of the drum is separated from the compartment 119 by means of a partition wall 121. The pipe 114 leads to the compartment 120 so that this compartment is always under pressure while the compartment 119 connects, through a pipe 122, with the three-way valve 111 so that as the plug 115 is oscillated connection is closed between the hollow box 82 and the pump intake 112 and at the same instant communication is opened between the compartment 119 and the pump intake 112 through the pipe 122.

Thus it will be seen that as the strip 70^a of "super" is severed by the shearing plate 108, the suction of the pump acting through the holes 109 serves to hold the strip firmly on the hollow box 82 so that it will not be displaced thereon. As the hollow box 82 moves forward the end of the "super", as shown in Fig. 6, passes under the rotating drum 81 and at this instant the plug 115 oscillates to cut off suction on the hollow box 82 and at the same instant transfers the suction to the compartment 119. The end of the "super" which then lies adjacent the drum 81 is drawn up against the drum and as the latter revolves is wound around the drum as shown in Fig. 6. The suction action continues on the strip thus held against the periphery of the drum, until the forward end of the "super" strip passes over the compartment 120 when the pressure within this compartment, acting through openings 123 in the peripheral portion of the drum 81, blows the forward end of the "super" up against the bottom of the book which has previously been glued as above explained, the rear portion of the "super," however, still being firmly held by the suc-

tion in the compartment 119. It is, of course, essential that the timing of the "super"-feeding mechanism be such that it operates in timed relation to the feed of the main conveyor 10 so that the "super" will fall at the proper point on the book.

The book, with the "super" applied thereto as stated, then passes to the cover-applying mechanism 18 the construction of which is the same as that set forth in my said above entitled application and which operates to exert upward force against the portion of the cover which extends beneath the edge of the book to which the "super" was previously applied and also to squeeze the lower edge of the book to firmly secure together the sheets of the books, the "super" and the cover.

While I have shown and described a particular embodiment of my invention, I do not wish to be understood as intending to limit it thereto, as the same may be variously modified and altered without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is:

1. In a bookbinding machine, means for gripping and advancing a book, means for gluing the back of the book, and mechanism for applying a super in timed relation thereto comprising means for feeding super from a roll, means for cutting a strip from the roll, means for moving said strip adjacent the book and at the same speed as the book, and means for progressively forcing the strip into contact with said book.

2. In a bookbinding machine, means for gripping and advancing a book, means for gluing the back of the book, and mechanism for applying a super in timed relation thereto comprising means for feeding super from a roll, means for cutting a strip from the roll, means for moving said strip adjacent the book and at the same speed as the book, and means for progressively forcing the strip into contact with said book as it passes a predetermined point.

3. In a bookbinding machine, means for gripping and advancing a book, means for gluing the back of the book, and mechanism for applying a super in timed relation thereto comprising means for feeding super from a roll, means for cutting a strip from the roll, an air controlled drum having a perforated face for moving said strip adjacent the book and at the same speed as the book, and means for forcing the strip into contact with said book during the movement of the book.

4. In a bookbinding machine, means for gripping and advancing a book, means for gluing the back of the book, and mechanism for applying a super in timed relation thereto comprising means for feeding super from a roll, means for cutting a strip from the roll, a rotatable drum having a perforated face, stationary partitions within the drum forming compartments, means for applying suction to one of said compartments to cause the strip of super to be held by said drum as it rotates, and means for applying air pressure to another compartment to cause the strip of super to be blown away from the drum as it advances.

5. In a bookbinding machine, means for gripping and advancing a book, means for gluing the back of the book, and mechanism for applying a super in timed relation thereto comprising means for feeding super from a roll, means for cutting a strip from the roll, a rotatable drum having a perforated face, stationary partitions within the drum forming compartments, means for applying suction to one of said compartments to cause the strip of super to be held by said drum as it rotates, means for applying air pressure to another compartment to cause the strip of super to be blown away from the drum as it advances, and a valve for controlling the two last mentioned means in timed relation to the travel of the books.

6. In a bookbinding machine, means for gripping and advancing a book, means for gluing the back of the book, and mechanism for applying a super in timed relation thereto comprising means for feeding super from a roll, means for cutting a strip from the roll, a rotatable drum having a perforated face, stationary partitions within the drum forming compartments, means for applying suction to one of said compartments to cause the strip of super to be held by said drum as it rotates, means for applying air pressure to another compartment to cause the strip of super to be blown away from the drum as it advances, air suction means for holding the strip on the cutting-off means, and a valve for controlling the several air controlled means in timed relation to the travel of the book.

7. In a bookbinding machine, means for gripping and advancing a book, means for gluing the back of the book, and mechanism for applying a super in timed relation thereto comprising means for feeding super from a roll, means for cutting a strip from the roll, an air controlled drum having a perforated face for moving said strip adjacent the book and at the same speed as the book, and means for forcing the strip progressively into contact with the book.

8. In a bookbinding machine, means for gripping and advancing a book, means for gluing the back of the book and mechanism for applying a super in timed relation thereto comprising means for feeding super from a roll, means for cutting a strip from the roll, a rotatable drum having a perforated face and located adjacent the book, means for rotating said drum at substantially the

same speed as the book, means for producing suction at said perforated face for causing the strip to be held to said face and discontinuing suction on the strip in the rotation of the drum, and means for progressively forcing the strip from the drum against the book whereby the end portion of the strip last to be applied to the book is held to the drum by the suction action during the forcing of the opposite end portion of the strip against the book.

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