June 2, 1953 L. DE FLOREZ ET AL 2,640,208

METHOD AND APPARATUS FOR BUILDING IN THE CASES OF BOOKS

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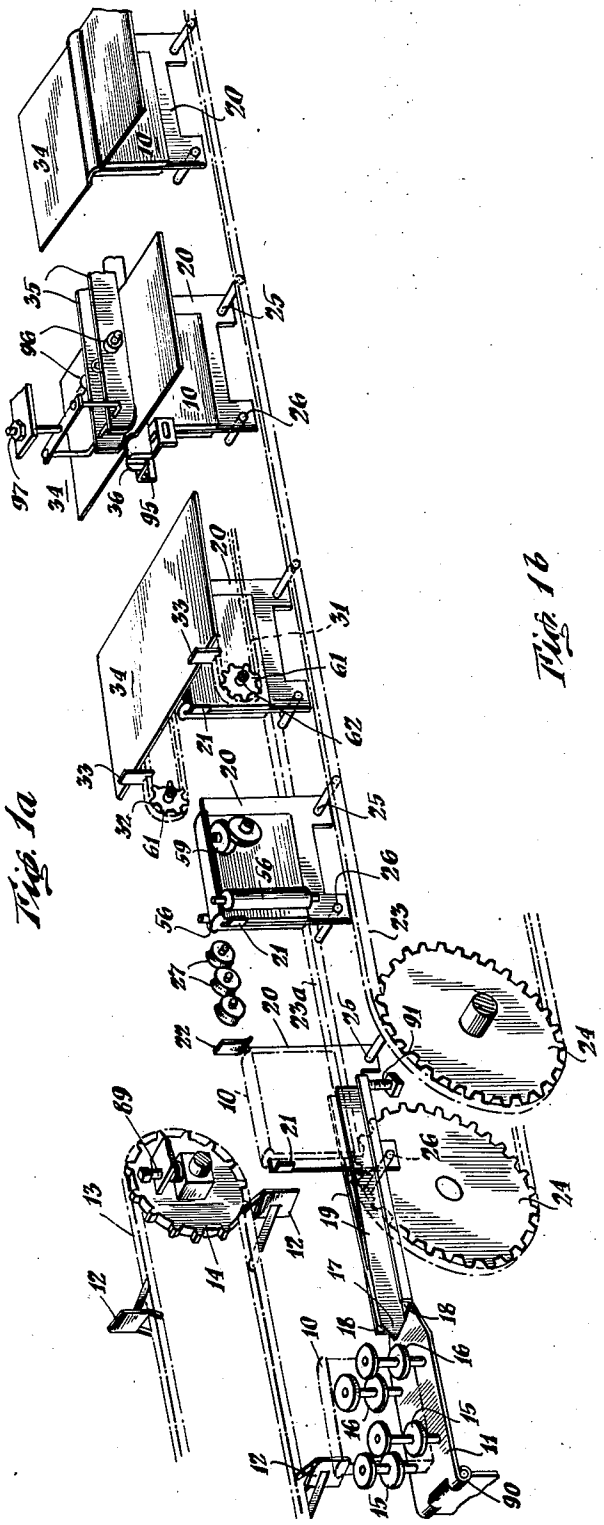


Fig. 1a

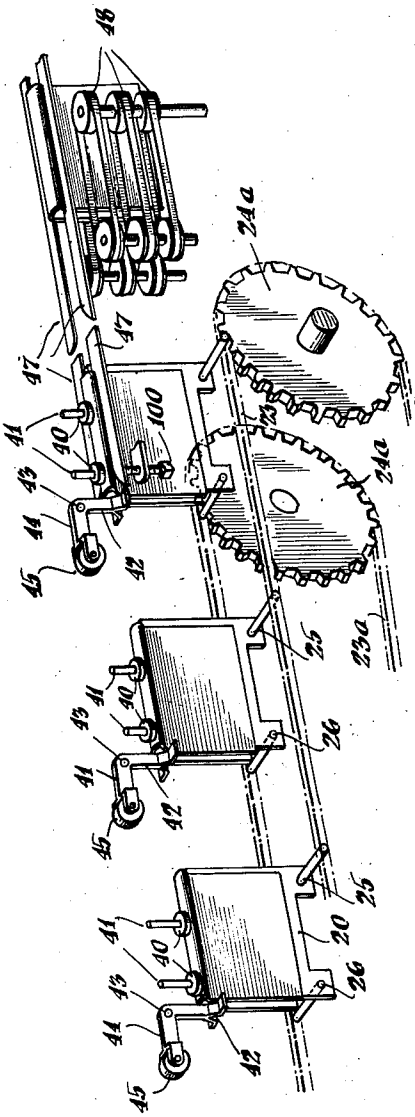


Fig. 1b

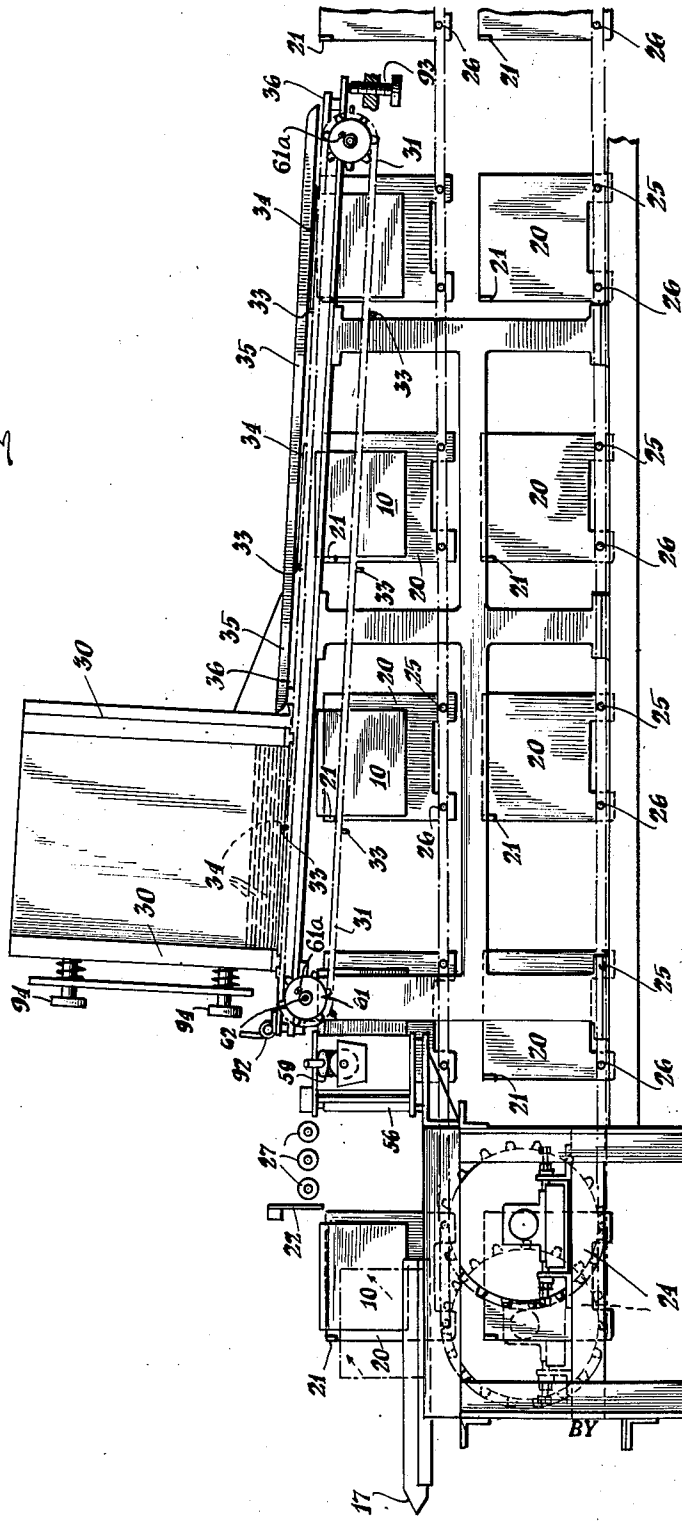
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METHOD AND APPARATUS FOR BUILDING IN THE CASES OF BOOKS

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Fig. 2a



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METHOD AND APPARATUS FOR BUILDING IN THE CASES OF BOOKS

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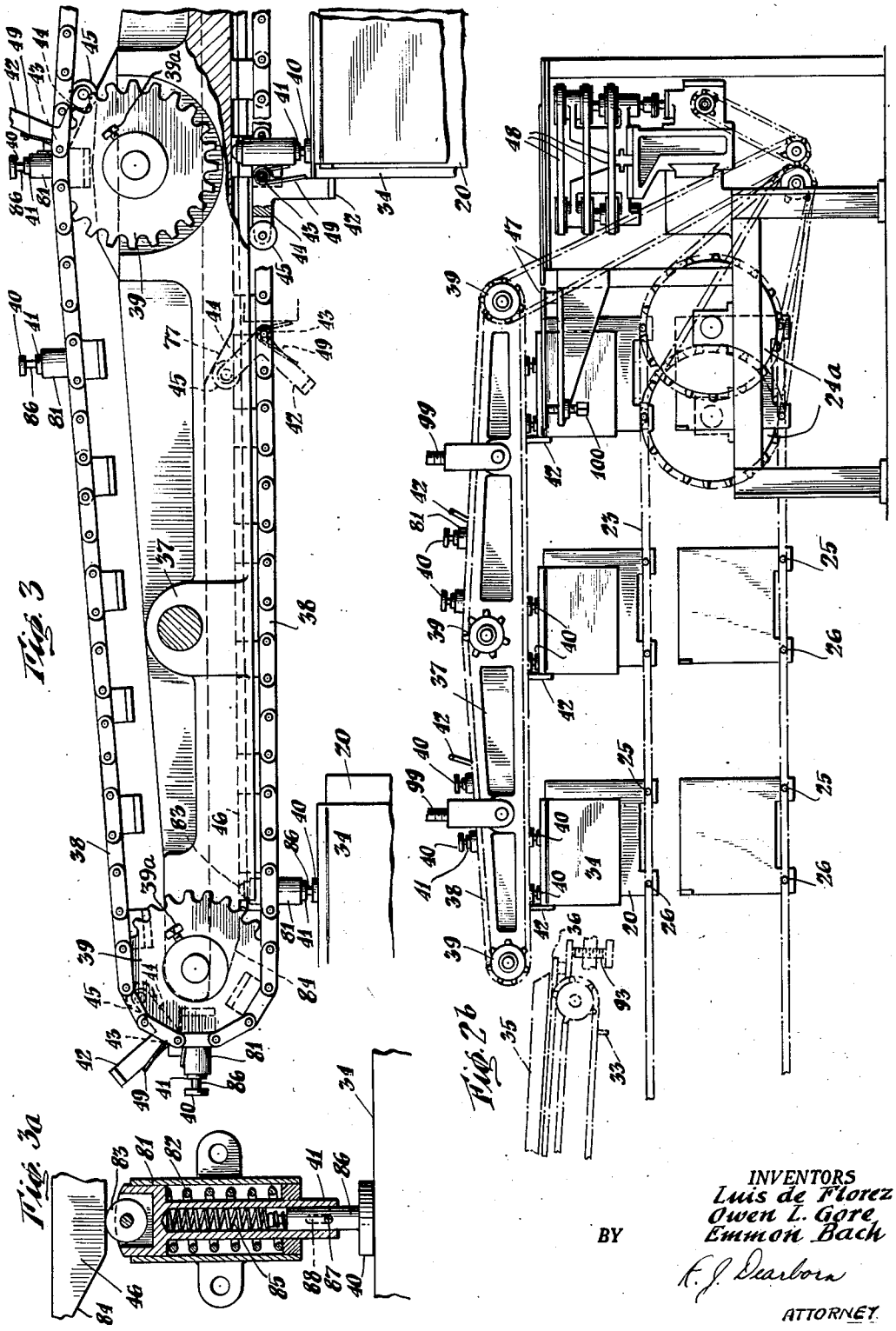


Fig. 3

Fig. 2b

Fig. 3a

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METHOD AND APPARATUS FOR BUILDING IN THE CASES OF BOOKS

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Fig. 4

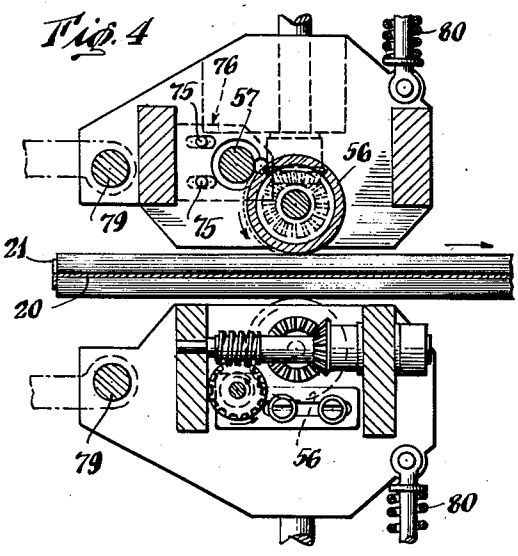


Fig. 6

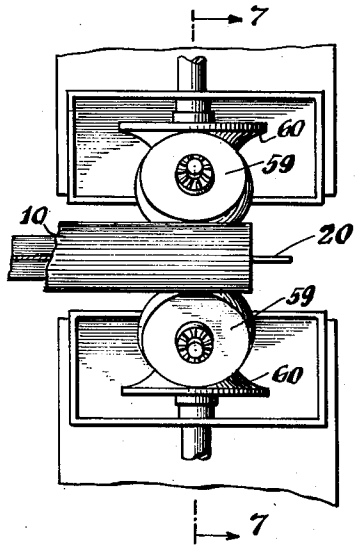


Fig. 5

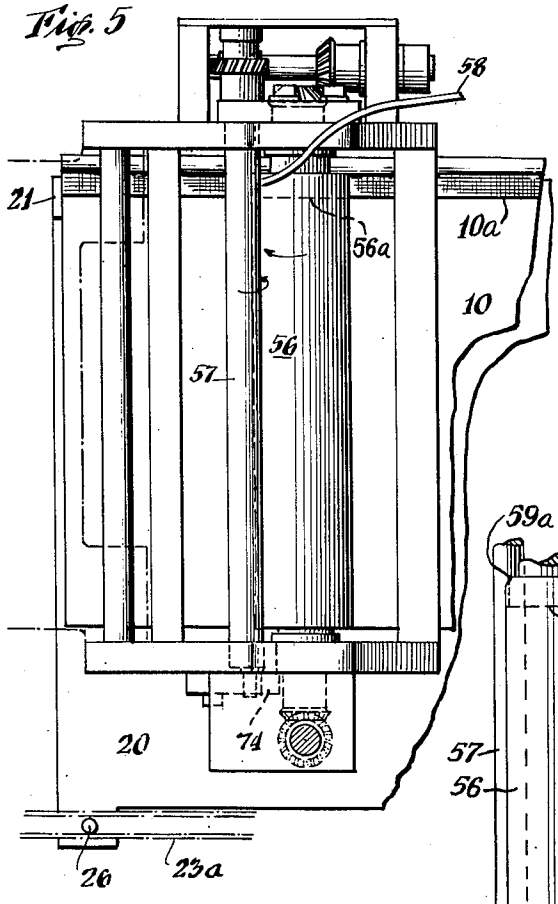
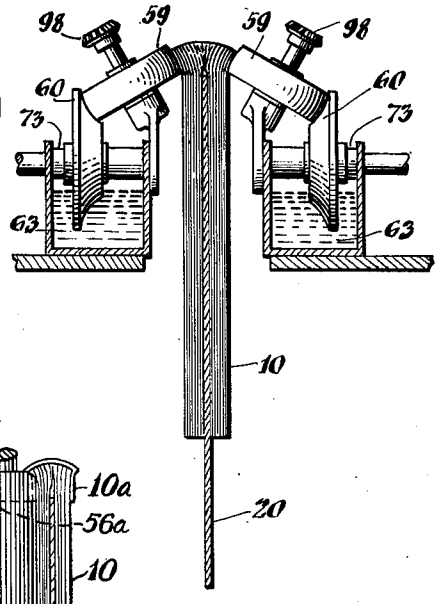


Fig. 7



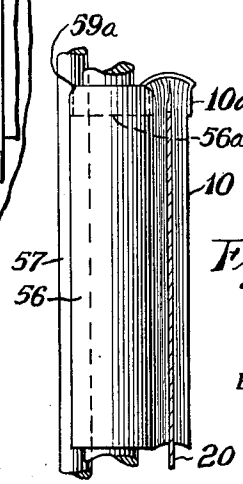


Fig. 7a

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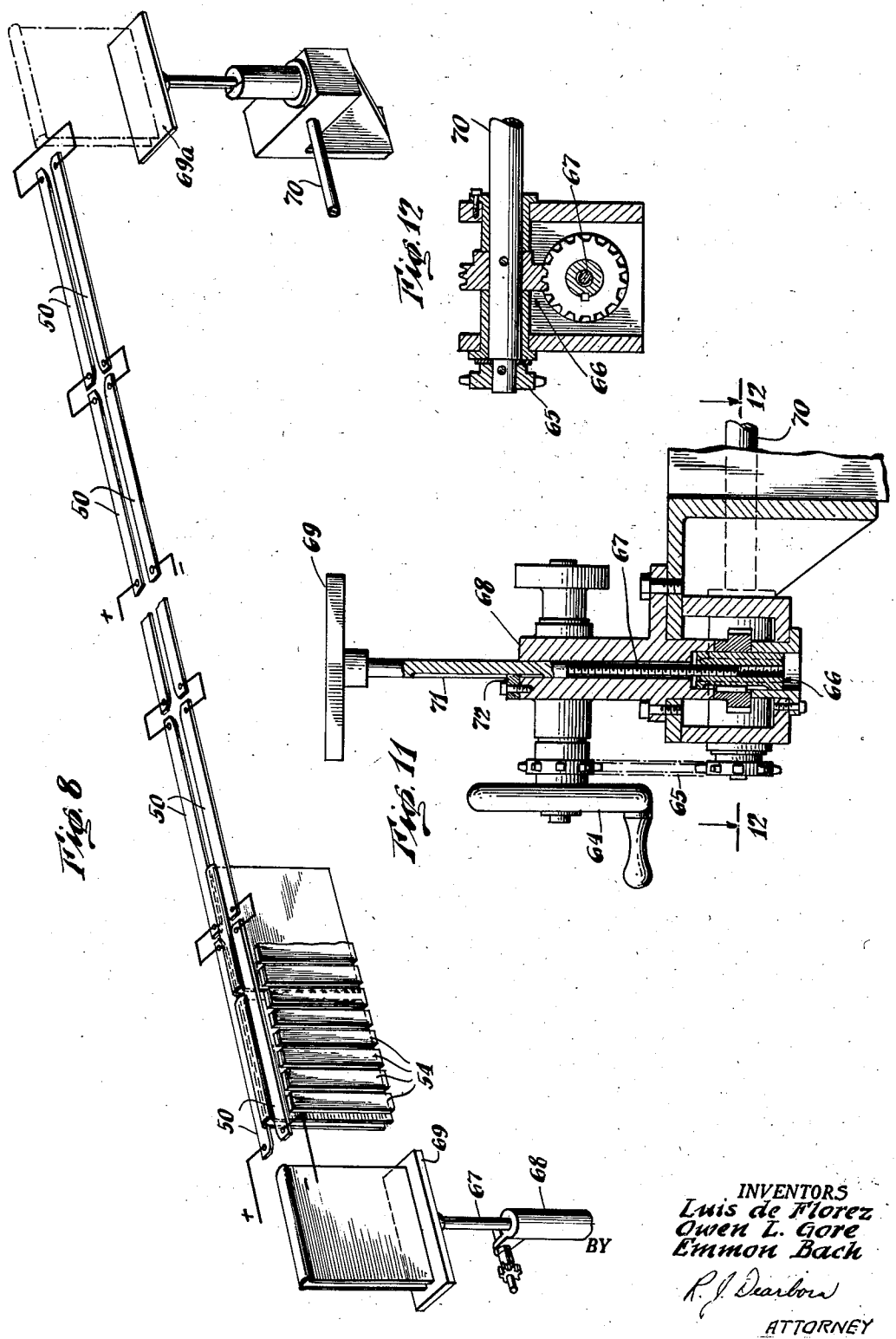
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METHOD AND APPARATUS FOR BUILDING IN THE CASES OF BOOKS

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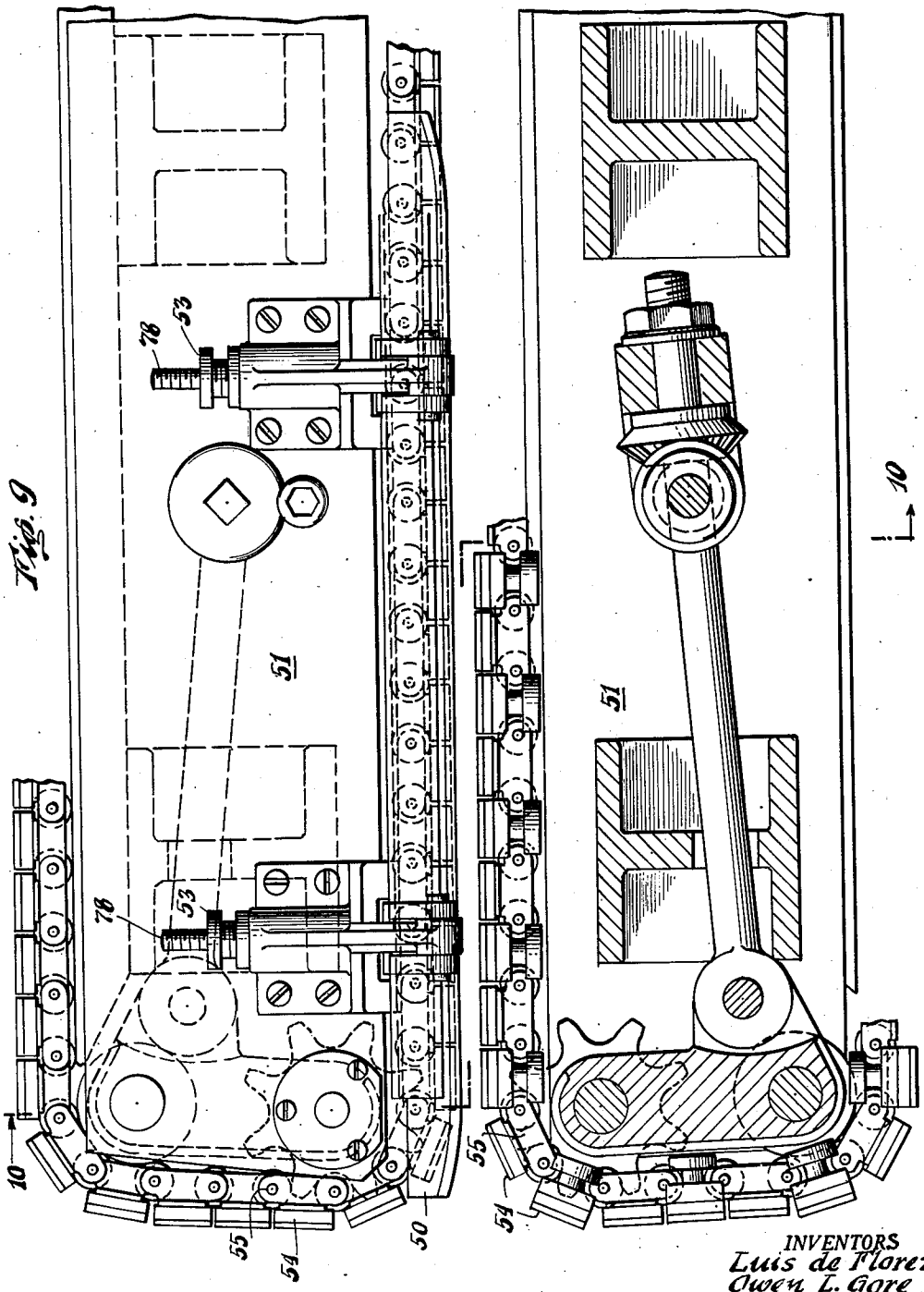


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METHOD AND APPARATUS FOR BUILDING IN THE CASES OF BOOKS

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METHOD AND APPARATUS FOR BUILDING IN THE CASES OF BOOKS

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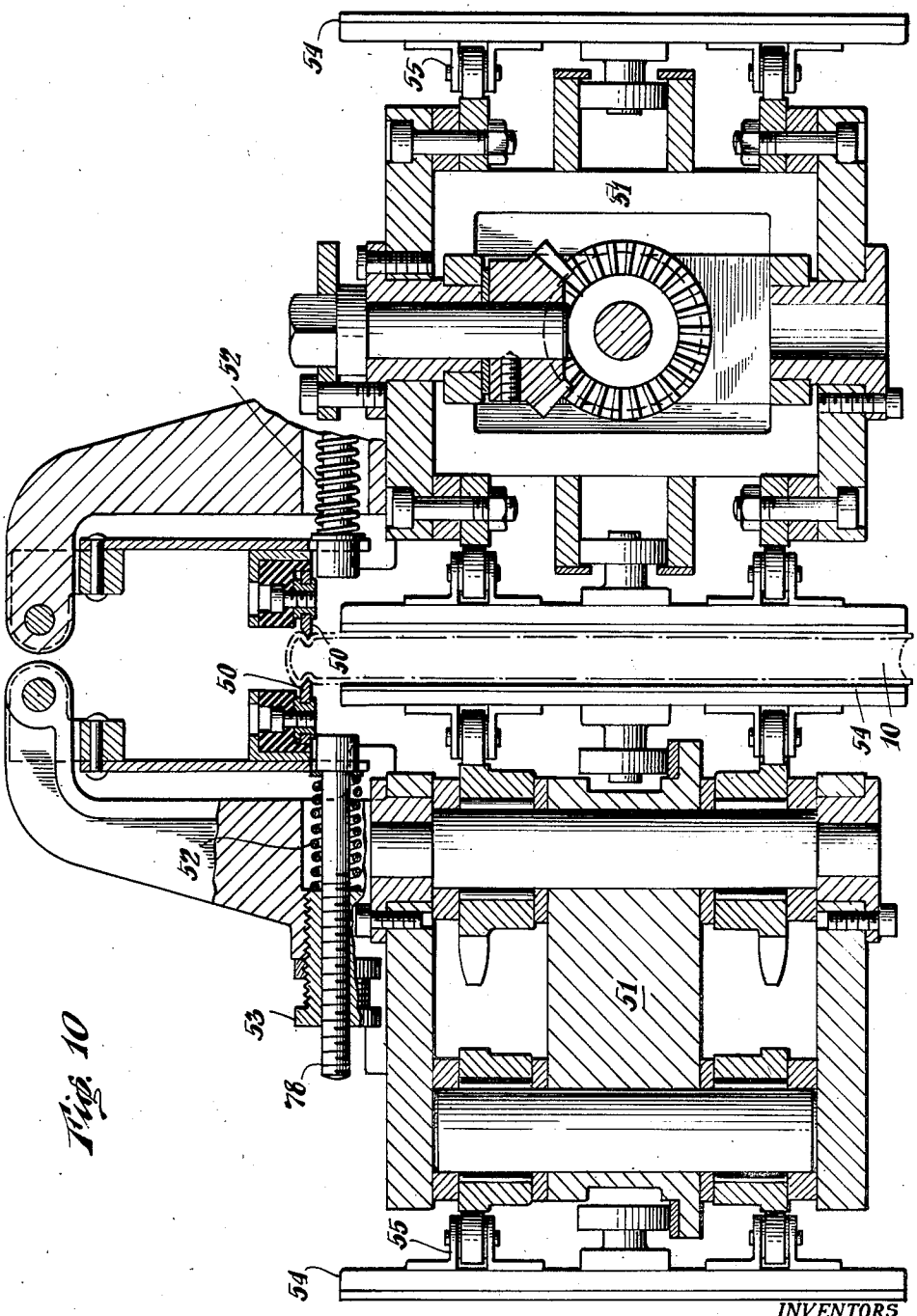


Fig. 10

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UNITED STATES PATENT OFFICE

2,640,208

METHOD AND APPARATUS FOR BUILDING IN THE CASES OF BOOKS

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Application November 13, 1948, Serial No. 59,846

5 Claims. (Cl. 11—1)

1

This invention relates to the manufacture of books and more particularly to the method and apparatus of applying the hard cases or covers to the book page blocks after the latter have been bound and their backs have been rounded and received a covering of crash.

The operation of applying the hard cases to books is referred to as "casing-in" and "building-in." The term "casing-in" includes the operations for applying adhesive coatings to the end sheets, hinges and crash of the page block and the placing of the case or book cover in registry on the page block. The expression "building-in" refers to the operations for ironing the hinge into the case of the book after the case has been placed on the page block, drying the adhesive between the hinge of the page block and the case and pressing the sides of the case into adhesive contact with the end sheets and the associated crash which extends from both sides of the binding edge of the page block. In present practice these operations are carried out by various types of machines having intermittent automatic motion and in some cases only the casing-in operation is carried out automatically, the building-in being accomplished manually by placing the cased-in books in pressboards where they remain for a number of hours. An important object of the present invention is to eliminate the time consuming methods which employ intermittent automatic movement machinery and the manual operations.

Another object is to provide a method and apparatus which will reduce the wastage resulting from imperfect squaring or registering of the cases in relation to the page blocks.

A further object is to obviate the applying of excess paste to the crash and the attendant difficulties arising from bubbles of paste being squeezed out between the end sheets and the case or cover. This invention makes it possible to apply a thin non-viscous adhesive so that there is no excess; the adhesive being such that it wets through the crash and precludes the situation in which dry surfaces are left between the crash, end sheets and case, with the resulting air bubble and non-adherence of the several members. The object of using a small quantity of high solids content adhesive is to drastically reduce the amount of water which the cardboard case must absorb and to thereby minimize or substantially eliminate warping of the case.

A still further object is to greatly increase the speed of the casing-in and building-in operations.

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This invention provides for the applying of cases to the page blocks by continuously advancing successive page blocks along a predetermined path, moving them into engagement with successive work means to carry out the operations of applying adhesive to the end sheets, hinges and crash of the page blocks, positioning and registering the cases on the page blocks, ironing a crease in the hinges, cases and page blocks and drying the adhesive between the hinge of the page blocks and the cases and pressing the case covers into adhesive contact with the end sheets.

Reference is made to an embodiment of the invention illustrated in the drawings, in which:

Figs. 1*a* and 1*b* are schematic perspective views of the casing-in portion of apparatus embodying the invention;

Figs. 2*a* and 2*b* are side views of the casing-in portion of the device;

Fig. 3 is an enlarged side view of the case register and articulated pusher assembly;

Fig. 3*a* is an enlarged vertical section of a part of Fig. 3;

Figs. 4 and 5 are plan and side views, respectively, of the assembly for applying adhesive to the end sheets;

Figs. 6 and 7 are plan and sectional end views, respectively, of the apparatus for applying adhesive to the hinge of the page block;

Fig. 7*a* is a side view of an alternate form of roller for applying adhesive to the hinge and the end sheets of the page block;

Fig. 8 is a schematic perspective view of the building-in portion of the apparatus;

Fig. 9 is a plan view of a portion of the building-in assembly;

Fig. 10 is a sectional view of the building-in assembly, taken along the line 10—10 as indicated in Fig. 9; and

Figs. 11 and 12 are detailed views of the apparatus for vertically adjusting the receiving and delivery platforms which may be associated with the building-in portion of the apparatus.

The apparatus embodying the invention which is illustrated in the drawings is supported, in a level, straight line operational arrangement, by a suitable frame not shown or described further than to say that it supports the apparatus at a height sufficient to provide proper clearance for the several drives, and chain sprockets associated with the apparatus, and also at a height which is convenient for the operators of the apparatus.

Referring to Figs. 1*a* and 1*b*, the book page blocks 10 are received on platform 11 in a vertical position with the binding edges uppermost. The book page blocks may be fed mechanically

or by hand onto the platform. The book page blocks are advanced endwise toward the apparatus by articulated pushers 12 carried by the endless chain 13, which moves around and is driven by the sprockets 14, one of which is shown in Fig. 1a. As the book page blocks advance toward the machine they pass between two pairs of vertical guide rollers 15 and 16. The guide rollers of each pair are disposed on opposite sides of the path along which the page blocks are being advanced, and as each page block passes between the rollers they engage the outer faces of the page blocks, each pair of rollers being yieldable for simultaneous equilateral displacement so that they are adapted to center each passing page block in the path. Any suitable means for mounting and actuating the pairs of self-centering rollers 15 and 16 may be used.

The page blocks thus properly centered advance and are engaged by a vertical splitter plate 17 disposed in the center of the page blocks' path, the splitter entering between the leaves of each page block at a point which substantially splits the leaves of the page block into two equal groups. The sides of the splitter 17 diverge in the direction in which the page block is being advanced, so that as it advances the split in the page block is widened. The split page block is pushed along two U-shaped channels 18, the inner walls of which are the diverging sides 19 of the splitter plate. As the page block advances along the U-shaped channels 18 the pusher lug 12 rises out of engagement with the page block at a locality where a supporting and conveying saddle 20, rising through the opening between the diverging sides 19 of the splitter, enters the split in the page block and lifts the book from the U-shaped channels 18 and moves it forward for processing. The saddle 20 is provided with a projection or register stop 21 at its rear edge, against which the page block is pressed by a spring-loaded lug 22 positioned above and depending in the path of the page block which is being carried forward by the saddle. The saddle 20 is part of the saddle conveyor consisting of endless roller chains 23, 23a, on which individual saddles are attached at spaced intervals. The attachment is so designed that the saddle remains parallel to the path of the book at all times. This is accomplished by attaching the forward end of the saddle to one chain, i. e., endless chain 23, and the rear end to another chain, i. e., endless chain 23a. The sprockets 24, 24a on which the chains 23 and 23a are mounted are offset along the path of travel as shown in Figs. 2a and 2b by an amount equal to the distance between the chain attachments to the saddle, the chain attachments to the saddles 20 being at the front and rear ends of the saddle plate at the points 25, 26. It will also be noted that the chains and the sprockets upon which they are mounted are slightly offset laterally on either side of the path of the saddle. The attachment 25 to the front of the saddle on endless chain 23 and the attachment 26 to the rear end of the saddle on endless chain 23a are made from opposite sides of the saddle plate, giving it support from both sides and affording a high degree of stability to the saddle, also thereby permitting the saddles to be conveyed in a constant parallel upright position. The saddles themselves comprise single thin plates having a height and length sufficient to accommodate books of several sizes and shapes and having suitable projections 21 attached to the rear end of the saddle which act as register stops against which the book may be slid as described above. The projections 21 may be easily removed to substitute projections of different sizes to allow for the processing of books of various thicknesses.

The book page block resting on the saddle and in register against the projection 21 at the rear of the saddle is flattened down against the top of the saddle by means of rollers 27 and then passes between adjustable vertical rolls 56 which apply an adhesive coating to the end sheets of the page blocks. The book page block then advances between a second pair of adjustable rolls 59, these being sized and positioned to apply an adhesive coating to the hinge of the page blocks.

The page block being processed is then moved forward to receive the case or hard cover of the book. The cases 34 are fed from a vertical magazine 30, as best shown in Fig. 2a, by a conveyor comprising a pair of endless chains 31 and 32 with attached pusher lugs 33, the case conveyor being located directly above, and sloping down at a slight angle to the saddle conveyor. The angle of the slope should be such as to provide sufficient clearance for the book blocks resting on the saddles to pass, beneath the case conveyor and the associated case ironer 36, to the point where the cases are positioned on the page blocks. An angle of about 4° has been found suitable. The individual cases, having been withdrawn from the bottom of the vertical magazine 30, pass under guides 35 spaced to correspond to the width of the backstrap and positioned above the cases and over a heated case ironer 36 which reproduces the shape of the book being processed, the guides 35 comprising parallel bars disposed longitudinally in the direction of the travel of the case and, contacting the case along their edges, they press the case into engagement with the heated case ironer 36 causing the center of the case to conform to the curve of the case ironer 36 thus forming a backstrap corresponding in size and shape to the rounded back of the page block. With regard to the position of the case conveyor, it should be noted that the cases are delivered to the page blocks as soon as possible after gluing. The cases 34 are released onto the page block and the pusher lugs 33 move out of engagement with the case at the position shown in Fig. 2b where the overhead register or articulated pusher assembly 37 contacts the back strap of the case and holds it in position on the page block. The overhead register assembly 37 comprises an endless chain 38 supported by sprockets 39. At intervals along the endless chain resilient pads 40 are mounted in spring-loaded plungers 41. The pads are adapted to engage the backstrap of the case. Associated with the pads 40 and also mounted on the endless chains are pusher lugs 42, which are adapted to press against the rear end of the case and insure the proper registry with the book blocks. Referring to Fig. 3a each resilient pad 40 is positioned on the end of shaft 86 which is slidably mounted in the plunger 41. The plunger 41, in turn, is mounted slidably in the sleeve 81 which contains spring 82 arranged to urge the plunger 41 up and out of engagement with the backstrap of the case 34. Roller 83 is rotatably mounted at the upper or inside end of the plunger 41, which projects above the sleeve 81. The shaft 86 with its associated pad 40 is urged out of the plunger toward the backstrap of the case by the spring 85 positioned inside the plunger 41. Fixed pin 87 which is mounted in the slot 88 of the shaft 86 retains the shaft

86 in the plunger 41 permitting it to slide in and out within the limits of the slot 88. The articulated pusher lugs 42 are pivotally mounted on the endless chain at points 43 and have arms 44 extending at right angles to the pusher lugs. At the end of each arm 44 is mounted a roller 45. As the pusher lugs 42 and the resilient pads 40 move around the sprocket 39, the rollers 83 on the inside end of the plungers 41 and the rollers 45 positioned at the end of the arms of the pusher lugs contact, respectively, the cam plates 46 and 77 which are located above the endless chain 38 in the area where the endless chain is moving along adjacent to the books. Cam plate 46 contacts and depresses the plungers 41 at the point 84 so that the pads 40 contact the backstrap of the case as the case is being delivered to the page block. After the plunger 41 has been depressed by the cam 46 the pad 40 is held against the backstrap of case 34 by the pressure of spring 85. The cam plate 77 causes the roller 45 to be depressed, swinging the pusher lug 42 into a vertical position behind the case 34, as best shown in Fig. 3. Before being depressed by the cam 77, the pusher 42 is held in the position shown by the dash-line in Fig. 3. The spring 49 maintains the pusher 42 out of operative position.

As the books advance beyond the case conveyor, the covers of the case are allowed to drop into position beside the adhesively coated end sheets of the page block 10. The books continue to advance, with the cases held in registry by the pads 40 and the lugs 42, to a position where they are engaged by nipper bars 47 which are located on opposite sides of the path of the hook and engage the hook along the groove of the hinge of the case and page block. The nipper bars comprise parallel strips which are flared out at the book receiving end and engage the hinge of the book along their parallel edges, the book being urged into engagement and slid along the nipper bars by the pusher lugs 42 and the resilient pads 40. At the position as shown in Figs. 1*b* and 2*b*, where the book, including the case and page block, is fully supported along its hinge by the nipper bars 47, the conveying and supporting saddle 20 withdraws from its position in the page block and passes down and around the sprockets 24*a*. The pusher lug 42 and the pads 40 prevent any slippage of the case with respect to the page block as the book slides between the nipper bars.

When the saddle conveyor is comprised of individual saddles 20, it is necessary to have the saddles separated for clearance purposes as the chains 23 and 23*a* pass over the sprockets 24 and 24*a*. It is therefore necessary to leave spaces between the saddles during the casing-in operations. However, during the building-in process the space between the books may be reduced to that of the maximum book length for which the machine is to be designed, thereby reducing the speed of travel and permitting the building-in time to be increased for any given length of machine. In order to accomplish this reduction of speed and distance between the books, the articulated pusher conveyor, including the pusher lugs 42 and the resilient pads 40 mounted on the plungers 41, advances the book, which is still supported on the nipper bars 47, into engagement with and between flat belts 48. The flat belts are driven at a reduced speed, having an overdrive clutch (not shown). It has been found that several pairs of opposing rollers may be substituted for the flat belts 48, with individual overdrive clutches. Each pair of the rollers may be self-centering in the same manner as rollers 15 and 16.

As the books enter between the flat belts 48, the pusher lugs 42 and the spring-loaded plungers 41, with their associated pads 40, move out of engagement with the backs of the cases. In order to avoid the possibility of a pusher lug 42 damaging the end of a case as it moves up and out of engagement with the case, the cam plate 77 terminates at the point where the page blocks are engaged and conveyed forward by flat belts 48. The roller 45 at the end of the arm of the pusher lug 42 no longer supports the pusher lug in its vertical position after the cam plate 77 has terminated, and the spring 49 associated with the pivot 43 for the pusher lug 42 presses the pusher lug back and out of engagement with the end of the case 34. Similarly, the cam plate 46 terminates and the pads 40 move up and out of engagement with the backstrap of the case 34.

Should it only be necessary to case-in the book, the latter would be removed at this stage in the operation or it might be removed prior to the transfer from the articulated pusher and register conveyor 37 to the flat belt conveyor 48, i. e. just after the withdrawal of the saddle 20.

The flat belt conveyor comprised of belts 48, advances the book along the nipper bars 47 into and between a series of sets of heated nipper bars 50 which are positioned on opposite sides of the path of the book at a height to enter the hinge of the book. As the book advances from the supporting bars 47 to the heated nipper bars 50, the sides of the book are released by the flat belts 48 and are received between the plate or flat belts 54 of a plate belt conveyor 51 (see Figs. 9 and 10), which further compress the case covers against the adhesively coated end sheets and slide the book along the heated nipper bars 50. The nipper bars 50 between which the book has been introduced are so shaped that they will form the required hinge in the book. They may be continuous parallel strips or may be made up in sections which flare out at the ends as indicated in Fig. 8 and Fig. 9, so as to prevent damage to the case as the book is introduced or released from the bars 50. The nipper bars are electrically heated by passing a low voltage directly through them so that an ironing effect is produced at the hinge line of the book. The heat is also utilized to dry the adhesive between the case and the hinge of the page block. In order to permit the processing of books of various thicknesses, the bars 50 are constructed so as to permit adjustment in a horizontal plane about a constant center line. They are also spring-loaded by springs 52 with suitable adjustable stops 78 to permit the introduction of the book and the subsequent application of even pressure along the hinge. The length of the individual nipper bar sections and the number of sctions to be used depends on the depth of the hinge desired and the length of time required to dry the adhesive used in the hinge.

As we have noted, the book is introduced from the flat or V-belt conveyors 48 into a continuous flat or plate belt conveyor 51 associated with the nipper bars 50. This conveyor system may consist of narrow vertical plates 54 attached to an endless roller chain 55 as illustrated in Figs. 9 and 10 such that the book while compressed from both sides by these plate belt units is advanced along between the heated nipper bars 50. The plates 54 may be backed by rollers or balls run-

ning on tracks or by a continuous large roller chain supported against a fixed track so that by adjustment of the tracks continuous pressure can be exerted against the sides of the book to obtain a firm bond between the covers of the case 34 and the end sheets.

The adhesive applying assemblies illustrated in Figs. 4 to 7 include the vertical adhesive applying assembly having adhesive applying rolls 56 which are disposed at the two sides of the path of the page block and are so positioned that a coating of adhesive is applied to the end sheets on each side of the page block. The vertical applicator rolls 56 are sized to contact the entire width of the ends sheets which pass between them, the peripheral speed of the rolls 56 being the same as the speed of the saddle conveyor 20 and the page blocks 10 carried on the conveyor. Each of the applicator rolls 56 receives a thin coating of adhesive from a glue reservoir, not shown, which feeds the adhesive to the roll 56 by pouring adhesive through a small tube 58 positioned near the top of the roll 56 as shown in Fig. 5, the adhesive being fed by gravity to the juncture of the doctor roll 57 and the applicator roll 56. The doctor rolls 57 are of smaller diameter than the applicator rolls and are geared to rotate at a speed considerably less than the speed of the applicator rolls, and in the opposite direction to the rotation of the respective applicator rolls. As the adhesive is fed to the rolls 56 and 57 from the tube 58, a bead of adhesive forms and is carried down between them. As the adhesive emerges from between the rolls the adhesive clings to the applicator rolls 56, the doctor rolls 57 remaining substantially dry.

It is believed that the difference in speed of the rolls 56 and 57 causes all of the adhesive passing through the gap between the rolls to adhere to the roll 56 rather than the film of adhesive dividing itself between the surface of the roll 57 and the surface of the roll 56. However, dust, small pieces of paper or other foreign matter passing between the rolls adhere to the doctoring roll 57 rather than the applicator roll 56. In any event, the phenomenon is important in achieving a fine tolerance in the thickness of the adhesive film to be applied to the page block. The relative thickness of the adhesive coating to be applied may be controlled by changing the distance between the doctor rolls and the applicator rolls, i. e. the smaller the distance between the doctor rolls and their respective applicator rolls the thinner the coat of adhesive which is transferred to the applicator rolls and consequently the thinner the film of adhesive applied by the applicator rolls 56 to the end sheets of the page blocks, the actual transfer of the adhesive not being accomplished by the contact of the transfer rolls with their respective applicator rolls but rather by the bead or bridge of adhesive which builds up between the rotating surfaces. The greater speed of the roll 56 causes the adhesive bubble or bead to remain against the roll 57 and between the two rolls. Adjustment between rolls 57 and 56 is made by moving the mounting 76 of the rolls along the slots 75 and fixing it in the desired position. In this manner it is possible to apply a continuous film of resin emulsion as thin as .0025 inch to the end sheets. Such thin films as may be applied in this manner preclude all possibility of excess adhesive being squeezed out between the end sheets and the case, as is experienced in other casing methods. The application of the adhesive to the end sheets may be accomplished by means of one set of applicator rolls as described above or by a series of sets of applicator rolls of the type described, in order to apply several coats of adhesive to the end sheets, or as illustrated in the present embodiment it may be practical to apply the adhesive to the end sheets by a single set of applicator rolls and apply the adhesive for the hinge of the page block by a second set of applicator rolls as illustrated in Figs. 6 and 7. The applicator rolls 59 illustrated in Figs. 6 and 7 are set at an angle and have a curved contacting surface of a configuration suitable to enter and contact the hinge of the passing page block. The applicator rolls 59 for the hinges are driven through bevel gears 98 at a peripheral speed which is the same as that of the advancing page block. The adhesive is transferred to the hinge applicator rolls 59 by transfer rolls 60 which rotate in the opposite direction to that of the applicator rolls and at the same speed as the latter rolls, and in the illustrated form the transfer rolls 60 are partially submerged in the glue pots 63 and carry the glue up to the applicator rolls 59 from the glue reservoir 63. The opening between the rolls 59 and 60 may be changed, to control the thickness of the adhesive coating applied to the hinge, by adjusting the rolls 60 to any desired position along the shafts 73.

As noted above, the application of the adhesive to the end sheets and hinges may be accomplished by means of one or a series of sets of applicator rolls. In the embodiment illustrated, one set of applicator rolls, i. e. vertical rolls 56, has been used to apply adhesive to the end sheets of the page block, and a second set of rolls, i. e. applicator rolls 59, has been used to apply adhesive to the hinge of the page block. Another method of applying adhesive to the hinge and the end sheets is to use a single set of rollers shaped to conform to the hinge and also to the vertical sides of the end sheets. Each of such rolls may be cylindrical in shape with a beveled upper end 59*a* such that will conform to the shape of the hinge, as shown in Fig. 7*a*. In certain operations it may be found that separate combinations of rolls are needed to apply the necessary amount of adhesive evenly onto the end sheets, crash and hinges of the page blocks. Also, it has been found that one means of applying an even coat of adhesive to both the crash 10*a* and the end sheets of the page blocks 10 is to provide applicator rolls which have been milled down, as indicated by dash line 56*a* in Figs. 5 and 7*a* so that the portion of the roll which contacts the crash is of less diameter than that which contacts the end sheets, the recessed portion being only as deep as the thickness of the crash. This arrangement is satisfactory because it permits the applicator rolls to be in full contact at all times with the end sheets and the crash and the recess provides space for an additional thickness of adhesive for application to the crash.

It has also been found satisfactory to apply the adhesive to the hinges and crash and thereafter to the whole end sheet, e. g. by interchanging the positions of adhesive rollers 56 and 59. This latter arrangement is of advantage because the adhesively coated end sheets tend to curl, and it is desirable to delay the end sheet coating so that they do not have too much opportunity to curl before the cases are applied. However, for purposes of illustration in this application, the description has been limited to a single set of vertical applicator rolls for applying adhesive to the end sheets and a second set of adhesive applicator

rolls, shaped to conform to the hinge of the page block, for applying adhesive to the hinges of the page blocks. The vertical applicator rolls **56** should be of sufficient length so that they will contact the entire width of the various sizes of page block end sheets which are, from time to time, processed in the apparatus. Drains **74**, as shown in Fig. 5, are provided to carry off any excess adhesive.

The invention thus described and the embodiment illustrated above may be used as a unit or the building-in and casing-in operations may be carried out separately or in conjunction with other apparatus. It will also be noted that the invention may be used effectively in a continuous process method of book manufacture in which the invention becomes an integral part of the process. In such a process the page blocks to be cased-in and built-in may be received directly from a "rounding and backing" operation such as that described and claimed in the co-pending application of Luis de Florez, Peter de Florez and Owen L. Gore filed May 1, 1948, Serial No. 24,494, now Patent 2,577,568, granted December 4, 1951; and the books, after being cased-in and built-in may be forwarded to a locality where the jackets or dust covers may be folded onto the book covers. An apparatus of the type described and claimed in the co-pending application of Luis de Florez and Garrett B. Linderman, Jr., filed June 13, 1948, Serial No. 38,416, would be suitable for the jacketing operation.

So that the apparatus of this invention may have suitable flexibility for handling books of the various sizes and shapes which are normally processed in a book publishing plant, the several members and elements of the apparatus are made adjustable to receive books of different thicknesses, lengths and widths. Specifically referring first to Fig. 1*a* the initial conveyor assembly including endless chains **13** mounted on the sprockets **14** and the associated articulated pusher lugs **12** may be vertically adjusted by suitable screw adjustments **89** so that the pusher lugs **12** may be raised and lowered to contact the various sizes of books being processed at the rear end of the page blocks slightly below the binding edge. As we have noted the sets of vertical rollers **15** and **16** are laterally adjustable and are spring loaded to press against the sides of the page block which is being advanced therebetween. The unit consisting of the rollers **15** and **16**, the slitter **17** and the U-shaped channels **18** may be hinged at the receiving end of the assembly as indicated at **90** to permit the raising and/or lowering of the book at the delivery end so that books of various widths, i. e. varying in height in the machine, may be processed. The screw adjustment **91** may be utilized to accomplish the vertical adjustment at the delivery end. The glue rolls **56** are pivotally mounted at points **79** and are adjustable for book thickness (as shown in Fig. 4). Springs **80** (Fig. 4) press the rolls **56** lightly against the book.

The case conveyor may be hinged at its upper end as indicated at **92** (Fig. 2*a*) to permit the case delivery end to be raised or lowered so that the case will be positioned on the page blocks at the proper level. The vertical adjustment at the case delivery end may be accomplished by suitable means **93**. With regard to the case conveyor it may also be said that the vertical magazine **30** is adjustable to receive cases of various sizes, the sides of the magazine **30** being laterally adjustable by means of the screw adjustments **94**. The case ironer **36** with its associated guides **35** is laterally adjustable by means of screw adjustments **95** and **96** (Fig. 1*a*) to process cases for books of varying thicknesses. The case ironer **36** may be composed of two segments to permit the lateral adjustment. The guides **35** are also vertically adjustable by suitable means **97**. Adjustment for the various overhangs of the cases for different books is accomplished by the rotation of the drive sprocket **61** in relation to the shaft **62**. The adjustment may be accomplished in any suitable manner such as by providing releasable set screws **61***a* on the hubs of sprockets **61** as shown in Fig. 2*a*. By the proper adjustment, the case pusher lugs **33** will deliver the cases the necessary distance of overhang in front of the page blocks. The overhead registry or articulated pusher conveyor assembly **37** is vertically adjustable to the height of the books being processed by screw adjustments **99** (Fig. 2*b*). An adjustment of pusher lugs **42** and the pads **40** for a change in the overhang of the cases may be accomplished by a rotation of the drive sprocket **39** in relation to its shaft, by providing releasable set screws **39***a* as shown in Fig. 3. It should be noted that the adjustment of the pusher lugs **42** may be made in conjunction with the case conveyor adjustment for overhang by driving both assemblies by their adjacent sprockets from a common sprocket (not shown) and making the adjustment at the common sprocket.

The nipper bars **47** are laterally adjustable throughout their length to receive books of different thicknesses and are vertically adjustable at their receiving end by screw adjustment **100**, to receive books having hinges at different vertical locations. In books of great thickness the hinge is further down from the center or peak of backstrap, than in thinner books. The belt conveyors **48** associated with the nipper bars **47** are also laterally adjustable.

In the building-in portion of the machine the heated ironing nipper bars **50** are laterally adjustable so that they may enter the hinges of books of various thicknesses and apply the proper ironing pressure to the hinges. In connection with the lateral adjustments of the nipper bars **47** and also the heated ironing bars **50**, the adjustments are made by turning the threaded bushings **53**, as best shown in Fig. 10, a certain additional flexibility of the adjustment is achieved by the fact that the ironing bars **50** and the nipper bars **47** are urged inward by springs **52** associated with the threaded bushings **53**.

The plate or flat belt conveyor system comprised of plate belts **54** are also laterally adjustable to conform to the thickness of the books being processed and may be adjusted so that any suitable degree of pressure may be applied to the covers of the cases **34**. The entire assembly **51** is adjusted about the center line, for book thickness by a double ended lead screw not shown in the drawing. The nipper brackets and their associated nipper bars **50** are thereby largely adjusted for book thickness. The additional adjusting arrangements at **53** permit two additional adjustments. The movement of the screw **78** and the threaded bushing **53** simultaneously permits adjustment of the amount of overhang between the nipper **50** and the pressing plates **54**. This adjustment may be made for the kind of cover material involved as well as for the size of the book. Rotating bushing **53** while holding the screw **78** stationary changes the amount of spring loading, by spring **52**, on the nipper bar **50**.

This may also be an adjustment to cause a desired pressure on a given cover material.

If the building-in portion of the apparatus is used as a unit, the receiving and delivery platforms of the apparatus should also be vertically adjustable in the manner shown in Figs. 11 and 12, i. e. by the rotation of hand wheel 64 actuating the chain and sprocket assembly 65 and the gear train 66 to raise or lower the screw-threaded shaft 67 which moves up through sleeve 68, the receiving platform 69 being mounted at the upper end of the shaft 67; the shaft 70 may be used to connect the adjustment assembly of delivery platform 69a with that of the receiving platform adjustment assembly thereby making it possible to raise and lower both platforms the same distance simultaneously by turning the hand wheel 64. The shaft 67 may be provided with longitudinal groove 71 to receive the projection 72 so that the shaft will not revolve in the sleeve and change the orientation of the platform positioned thereon.

If the building-in portion of the apparatus is to be used in conjunction with, and as an integral portion of the whole apparatus, there is no necessity for a vertical adjustment of the receiving platform for when the machine is part of the whole apparatus, the receiving platform and the device associated therewith is dispensed with and the books merely slide from the nipper bars 47 onto the heated nipper bars 50, the vertical adjustment for the books having been made by the vertical screw adjustment 100 at the point where the books were received between the nipper bars 47.

In the case ironing station of the apparatus, as shown in Fig. 1a, the flat cases are advanced by the pusher lugs 33 so that they pass into contact with the guides 35 and the backstrap of the case is urged downward into engagement with the case ironer 36, which is a heated bar member having the shape of the book page block upon which the case is to be mounted, the guides 35 acting to hold the back strap of the case down and against the heated ironing member 36 so that the case is properly formed. The guides 35 also operate to crease the case slightly along the sides of the backstrap along the line which will later become the hinge of the book. At the point where the cases are introduced under the guides 35, the guides curve upward slightly so as not to damage the case as it is pressed down into contact with the ironing member 36.

It will now be understood that an additional object of this invention is to provide a method and apparatus by which the cases of books may be applied to the page blocks in a straight line continuous operation to make a new and efficient method of book manufacture, and that this and the other objects are achieved by this invention.

In accordance with the provisions of the patent statute we have described herein the principles of this invention, together with the best mode of carrying out those principles, but it will be understood that the structure disclosed is only illustrative and the invention may be carried out by other means. Also while it is designed to use various features and elements in the combinations and relations described, some of these may be altered and modified in ways, other than those suggested, without departing from the spirit and scope of the invention.

We claim:

1. In the manufacture of books the method of building-in the hinge of books comprising continuously conveying successive work assemblies composed of page blocks, the end sheets and hinges of which have been coated with an adhesive, and cases registered thereon, along a predetermined path, engaging the cases of the assemblies, as they are continuously moved, along the line where the hinge is to be built in and continuously applying heat and pressure along substantially the entire length of said line and continuously applying pressure to substantially the entire faces of the sides of the cases, thereby pressing the cases into adhesive contact with the end sheets of the page blocks and ironing a hinge into the cases and drying the adhesive between the case and the hinges of the page blocks.

2. An apparatus for building-in the cases of page blocks, comprising, means for continuously conveying successive page blocks with the cases registered thereon and with wet adhesive between said page blocks and said registered cases along a predetermined path and into engagement with parallel supporting and ironing means positioned to engage the cases along the line where the hinge is to be built in, resilient means for continuously pressing said supporting and ironing means into pressure contact along substantially said entire line, said supporting and ironing means being adapted to iron the hinge into the cases as the successive page blocks are continuously advanced along the path defined by the parallel supporting means, and pressure applying and conveying means disposed adjacent and parallel to said supporting and ironing means to convey the successive page blocks and cases along said supporting and ironing means.

3. An apparatus for building-in the cases of page blocks, comprising, means for continuously conveying successive page blocks with the cases registered thereon and with wet adhesive between said page blocks and said registered cases along a predetermined path, conveying means adapted to engage the sides of the cases and to compress the cases against the page blocks as the page blocks are moved along the path, parallel supporting and ironing means positioned along said path and adapted to engage and support the page blocks and cases along the line where the hinge is to be built in, resilient means for continuously pressing the supporting and ironing means into pressure contact along substantially said entire line, said supporting and ironing means being adapted to iron the hinges into the cases as successive page blocks are continuously advanced along the path defined by the parallel supporting means, and by said pressure applying conveying means associated with said supporting and ironing means.

4. An apparatus as described in claim 3 wherein the pressure applying and conveying means are endless flat plate belts having vertically disposed case-engaging faces, resilient means being provided to press the portions of the respective conveyors adjacent the path into resilient pressure contact with substantially the entire sides of the cases.

5. The apparatus described in claim 3 wherein heating means are provided for heating the ironing and supporting means.

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EMMON BACH.

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