July 25, 1950 E. L. BUDDEN 2,516,446

BOOK BINDING

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FIG. 1

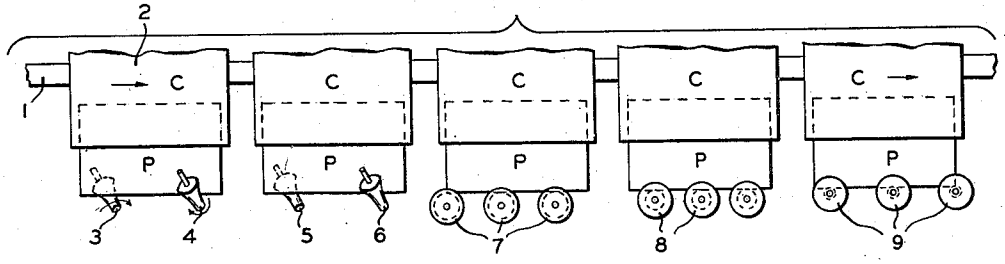


FIG. 2

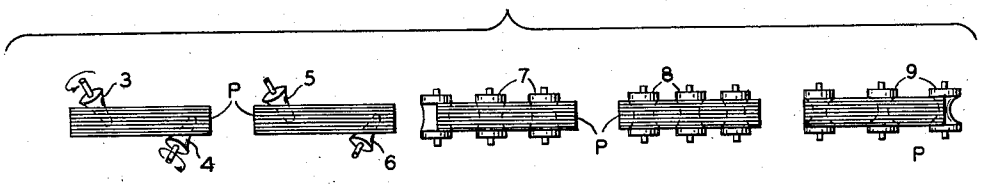


FIG. 3

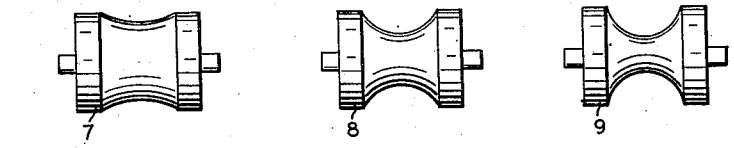


FIG. 4

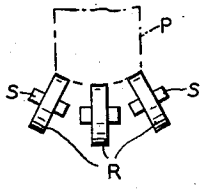


FIG. 5

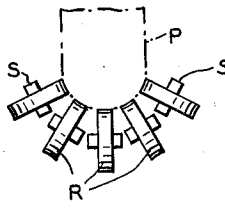
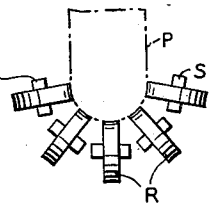


FIG. 6



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BOOK BINDING

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Fig. 7

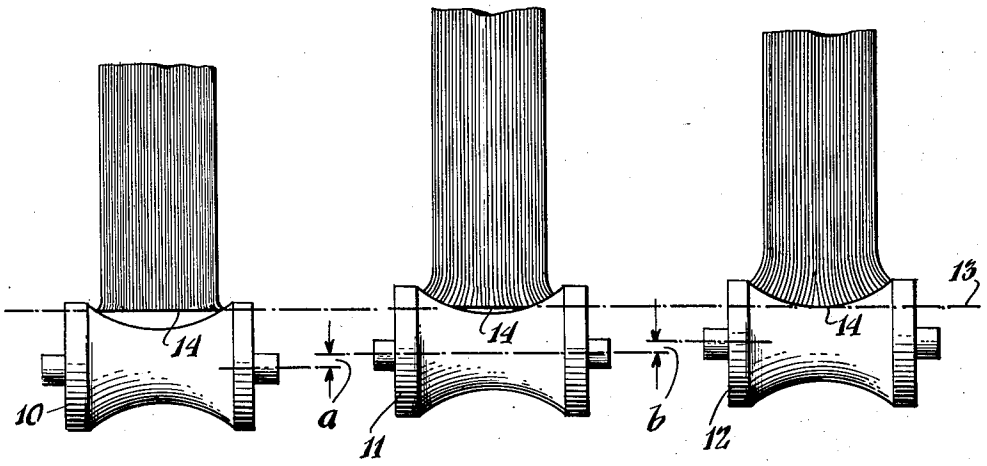
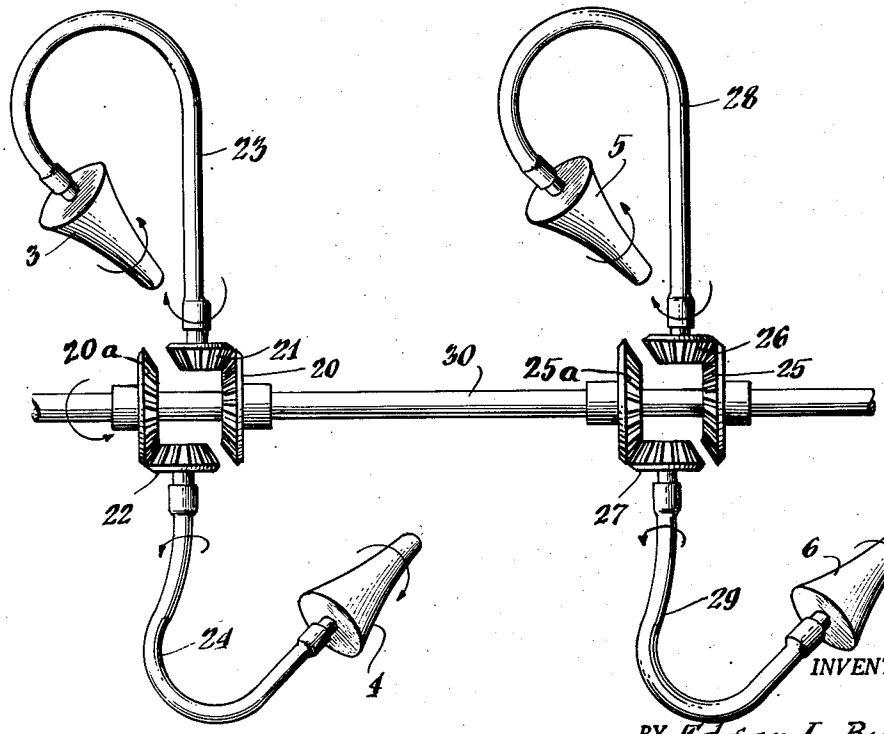


Fig. 8



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UNITED STATES PATENT OFFICE

2,516,446

BOOKBINDING

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Application July 29, 1947, Serial No. 764,288

5 Claims. (Cl. 11—5)

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This invention relates to the production of hard case books and provides an improved apparatus and method for rounding the binding edges and forming the joints on the page-blocks of the books. The invention is applicable to both sewn books and adhesively bound books. My invention is especially concerned with the rounding of the binding edge and the formation of the joints in a continuous and uninterrupted travel of the page-blocks.

At the present time, the binding edges are rounded and the joints are formed by holding the books motionless in clamps and rocking a concave plate from side to side while pressed into contact with the binding edges to spread the ends of the pages. The page-blocks are held in clamps mounted on a conveyor system which must be stopped opposite the rounding apparatus and held still while the rounding operation is performed. This results in intermittent operation. The excessive pressure required subjects the binding edge to severe stresses.

The present invention overcomes many of the objectionable features of present rounding and joint-forming practices. The invention provides a rounding and joint-forming method and apparatus in which the page-blocks for the books travel continuously while undergoing the rounding and joint-forming operations, and a positive means of controlling the spreading of the page ends at the joints. One aspect of the invention comprises rollers set at such angles to the travel of the page-blocks that the page ends are given an initial positive outward flaring to set or position the pages so that in the subsequent operations the pages will continue to be flared in the direction thus started. The rollers which initially contact the pages are preferably power-driven in the same direction as the travel of the page-blocks but at a greater speed. I may, however, so set the axis of rotation and the shape of the rollers that their rotation by contact with the page ends results in a component of motion that causes the pages to be dragged outwardly. These rollers may have ribbed, stippled or rubber surfaces which positively "take hold" of the paper and force it to spread outwardly.

As the page-blocks continue their travel in my invention, they encounter other rollers which are pressed against the previously flared or spread pages of the binding edge. Several similar rollers are preferably provided which are so shaped and positioned that they effect a progressive flaring of the pages in small increments until the joints and rounded back are completely formed.

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The last-mentioned rollers may be freely rotatable and driven by contact with the traveling page-blocks, or they may be power-driven at any required speeds. The bearing surfaces of such rollers are preferably concave, the degree of curvature becoming progressively more from roller to roller in the direction of travel of the page-blocks, the last one having the shape of the rounded binding edge. In another form of the invention, the rollers may all have the same shape but be set in different positions with respect to the binding edges so that each succeeding roller bears more heavily upon and advances the roundness a small increment. In still another form of the invention, I arrange sets of rollers on diverging shafts so that each one of the rollers in a set operates on but a portion of the binding edge, the aggregate surface of all the rollers of the set giving the roundness required.

These and other objects of the invention will be better understood after considering the following discussion taken in conjunction with the accompanying drawings, in which:

Fig. 1 illustrates more or less diagrammatically in side elevation an arrangement of apparatus embodying the invention;

Fig. 2 is a plan view of the rollers of Fig. 1;

Fig. 3 illustrates the form of the rollers of Figs. 1 and 2;

Figs. 4, 5 and 6 illustrate groups of rollers in a modified form of the invention.

Fig. 7 illustrates another form of the rollers which may be used in the device shown in Figs. 1 and 2; and

Fig. 8 represents a diagrammatic plan view of the power transmission for the power driven rollers.

The apparatus illustrated in Figs. 1 and 2 comprises a conveyor 1 which carries a series of clamps C, each of which engages the page-block P for a book. The conveyor carries the page-blocks continuously in the direction of the arrow 2. The page-blocks first encounter the set of flaring rollers 3 and 4 and then the set of flaring rollers 5 and 6, each roller of which is mounted upon a shaft at an angle acute to the direction of travel of the page-blocks and is power-driven, as shown by the arrows, in the same direction as the direction of travel of the page-blocks and at a greater speed. It will be noted that rollers 3 and 5 are on the opposite side, while rollers 4 and 6 are on the front side, as viewed in Fig. 1. These rollers have flared peripheral surfaces which may be ribbed, stippled, or of resilient rubber, so that they actually take hold of the ends of the pages

and force them outwardly in the initial stage of the rounding operation. Power to drive the rollers 3, 4, 5 and 6 is transmitted to them from main shaft 30 (see Fig. 8), which is driven by a suitable source of power not shown. Rotation of main shaft 30 is transmitted to the rollers 3 and 4 through beveled gears 20, 20*a*, 21 and 22 and flexible shafts 23 and 24. Similarly, the rotation of shaft 30 is transmitted to the rollers 5 and 6 through beveled gears 25, 25*a*, 26 and 27 and flexible shafts 28 and 29. The ends of the flexible shafts adjacent to the respective rollers 3, 4, 5 and 6 are suitably journaled in bearings supported by the frame. For the purposes of illustration, the rollers 3, 4, 5 and 6 have been displaced from the central axis of the path along which the books are conveyed. Arrows have been provided to indicate the rotational direction of the several rotating members. After the page-blocks pass over the last set of these flaring rollers, they come into bearing contact with the set of three rollers 7 which have slightly curved bearing surfaces and which advance the flaring or rounding of the pages a small increment. As the page-blocks continue to travel, they next encounter the three rollers 8 of the next set which are set at an elevation slightly above rollers 7. These rollers have a greater degree of curvature in their bearing surfaces than rollers 7 and advance the outward flaring of the page ends an additional increment. As the page-blocks continue to travel, they next come into contact with the set of three rollers 9 which are set at a higher elevation than the rollers of set 8. The rollers 9 have a still greater degree of curvature than the rollers of set 8 and give to the page-blocks their final flaring and rounding. Fig. 3 illustrates the curvatures of the three sets of rollers 7, 8 and 9. I may use one or more rollers in each set, depending upon the character of the page-block and the joint to be formed.

The three sets of rollers 7, 8 and 9 are preferably freely rotatable and hence are rotated entirely by contact with the page-blocks. It is to be understood that I may use any desired number of the aforementioned rollers to the end that the rounding and joint-forming operation is carried out during the continuous travel of the page-blocks.

Figs. 4, 5 and 6 illustrate three sets of rollers R which are mounted on diverging shafts S. The rollers R are each so nested together that their peripheral bearing surfaces in the aggregate outline the curve which they impart to the binding edges of the page-blocks as they travel progressively thereover. In other words, the three rollers of Fig. 4 effect a slight rounding, the five rollers of Fig. 5 an additional rounding, and the five rollers of Fig. 6 still an additional rounding. The three groups of rollers of Figs. 4, 5 and 6 may be used in place of the sets of rollers 7, 8 and 9 of Fig. 1. In such an arrangement of apparatus, the rollers 3, 4, 5 and 6 effect the outward initial flaring of the page ends and the rollers R are arranged to advance the flaring in small increments to the final shape.

Another form of the invention which has been mentioned above is illustrated in Fig. 7, in which the rollers 10, 11 and 12 are used instead of the rollers 7, 8 and 9 in Fig. 2. The rollers 10, 11 and 12 have the same shape or curvature and that curvature is the same as the ultimate shape which the rounded binding edge is to have. By positioning the successive rollers or groups of rollers 10, 11 and 12 at successively more elevated levels with respect to the binding edge (as indicated above), as the latter is conveyed over said groups of rollers, each succeeding roller or group bears more heavily upon the binding edge and thereby advances the roundness a small increment. The successive elevations of successive groups of rollers are also indicated in Fig. 1. However, they have been further illustrated in Fig. 7. The line 13 indicates the level of the binding edge 14, which remains constant throughout the rounding operation. The axis of the roller 11 is elevated the distance A above the axis of the roller 10 and the axis of the roller 12 is elevated the distance B above the axis of the roller 11.

I claim:

1. The method of rounding the binding edges of the page-blocks of books and forming the joints which comprises continuously conveying a succession of the page-blocks each of which is held securely in a clamp means over a set of rollers aligned at angles acute with the line of direction of travel of the page-blocks, said rollers being power-driven so that the peripheral surfaces of the rollers move in the same direction but at a greater speed than the travel of the page blocks and arranged to bear against the page ends and to flare them outwardly in both directions from the longitudinal center of the binding edge, and while the flared page-blocks are being conveyed passing them over at least one roller having a concave surface which bears against the binding edges and effects a complete flaring of the pages resulting in the rounding and formation of the joints.

2. The method of rounding the binding edges of the page-blocks of books and forming the joints which comprises continuously conveying a succession of the page-blocks each of which is held securely in a clamp means into contact with a set of rollers aligned at angles acute with the line of direction of travel of the page-blocks, said rollers being power-driven in the same direction as the travel of the page-blocks and at a peripheral speed greater than the speed of travel of the page-blocks to effect an initial flaring of the pages of the binding edge, and then forcing the initially flared pages outwardly to complete the rounding operation.

3. Apparatus for rounding the binding edge of page-blocks of books which comprises a conveyor means for securing and conveying a succession of page-blocks, at least two power-driven rollers mounted on shafts with their axes at acute angles to the direction of travel of the conveyor means, and means for driving the rollers in the same direction as the travel of the page blocks and at a peripheral speed greater than the speed of travel of the page blocks while in contact with the binding edges of the page-blocks, one roller being set to flare the pages on one side of the center outwardly and the other roller being set to flare the pages on the opposite side outwardly.

4. Apparatus for rounding the binding edge of page-blocks of books which comprises a conveyor means for securing and conveying a succession of page-blocks, at least two power-driven rollers mounted on shafts with their axes at acute angles to the direction of travel of the conveyor means, means for driving the rollers in the same direction as the travel of the page blocks and at a peripheral speed greater than the speed of travel of the page blocks while in contact with the binding edges of the page-blocks, one roller being set to flare the pages on one side of the center outwardly and the other roller being set to flare the pages on the opposite side outwardly, and other roller

means arranged to bear against the binding edge and effect a further flaring of the pages.

5. Apparatus according to claim 4 in which the other roller means have concave bearing surfaces.

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