

[54] **METHOD OF ROUNDING THE BACKS OF BOOKS AND A MACHINE FOR PERFORMING THE SAME**

[72] Inventor: **Frans Wiersma**, Reiden, Switzerland
 [73] Assignee: **Firma Jos. Hunkeler**, Wikon, Switzerland
 [22] Filed: **Dec. 9, 1969**
 [21] Appl. No.: **883,482**

[30] **Foreign Application Priority Data**

Dec. 17, 1968 Switzerland18702/68

[52] U.S. Cl.**281/21**, 11/5
 [51] Int. Cl.**B42d 1/00**, B42c 5/00
 [58] Field of Search11/5, 1 CD, 1 R; 281/21

[56]

References Cited

UNITED STATES PATENTS

3,460,174	8/1969	Fomm.....	11/5
2,516,446	7/1950	Budden.....	11/5
3,132,360	5/1964	Hawkes et al.....	11/5
3,466,682	9/1969	French.....	11/1 R

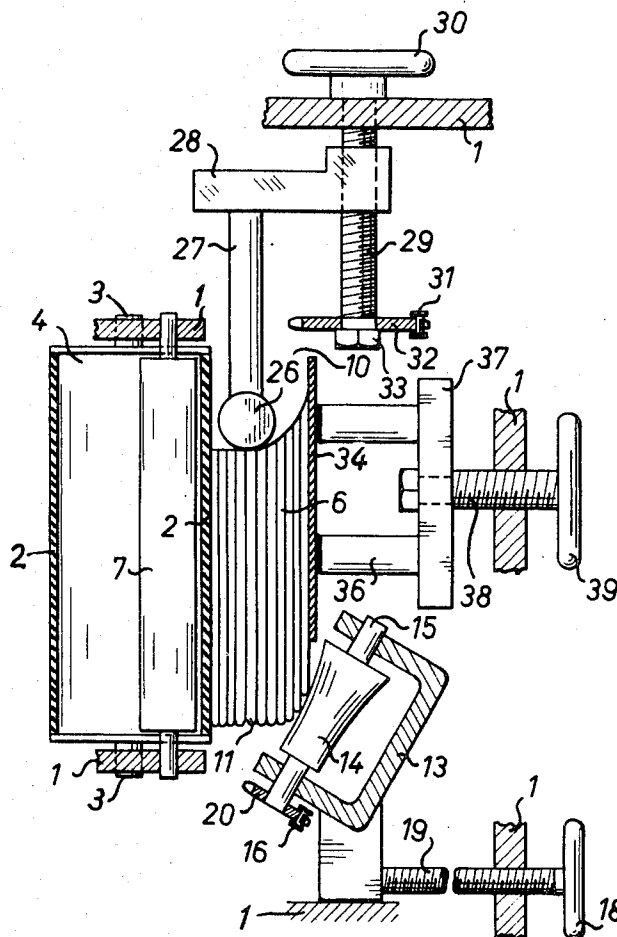
Primary Examiner—Lawrence Charles
Attorney—Flynn & Frishauf

[57]

ABSTRACT

A method and a machine for rounding the backs of books by first rounding one side of the backs with a first set of shaping rolls progressively approaching the median central plane of the books; whilst the books are conveyed through the machine and by then rounding the other side of the backs with a second preferably similar set of shaping rolls as the books continue to be conveyed through the machine.

10 Claims, 7 Drawing Figures



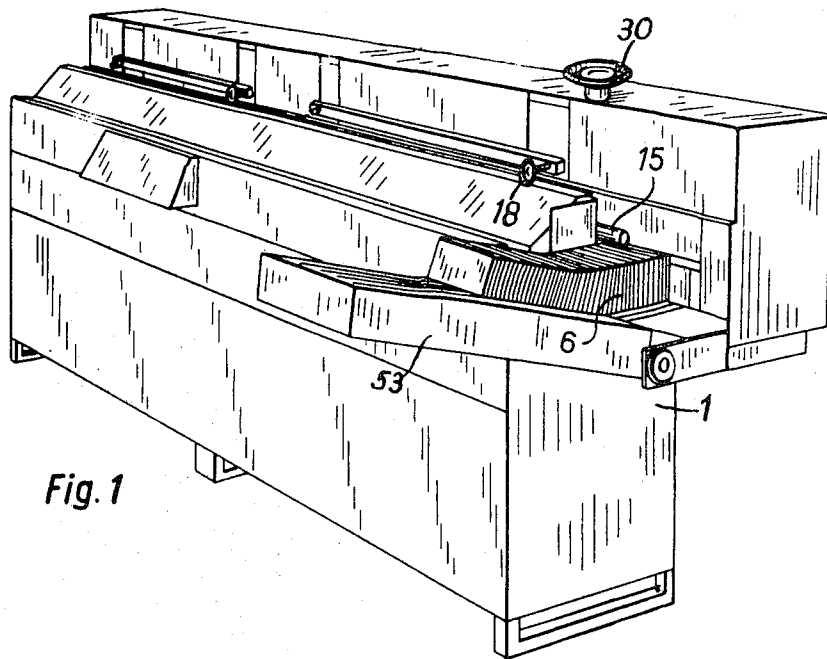


Fig. 1

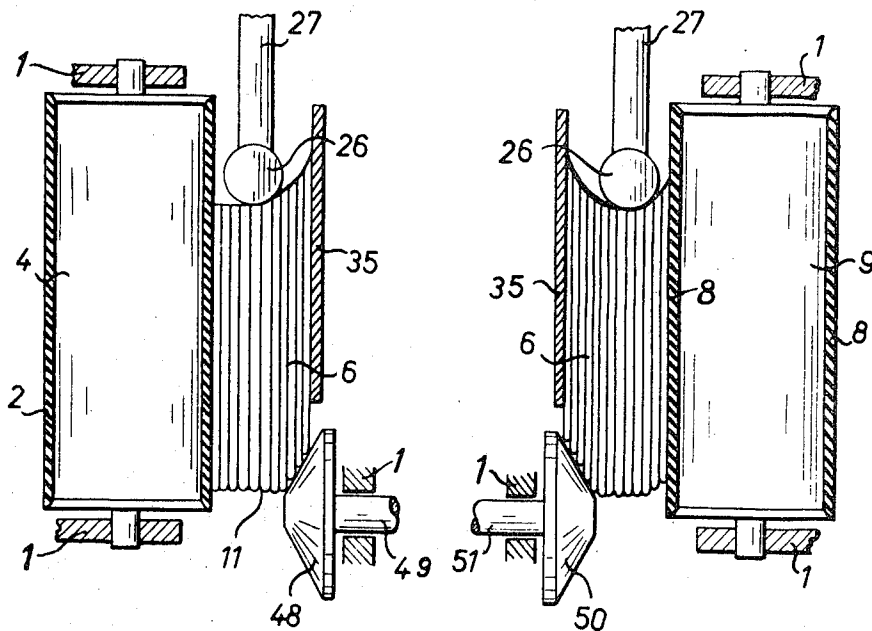


Fig. 6

Fig. 7

INVENTOR:
FRANS WIERMA
BY *Phyllis & Friskney*
Attys

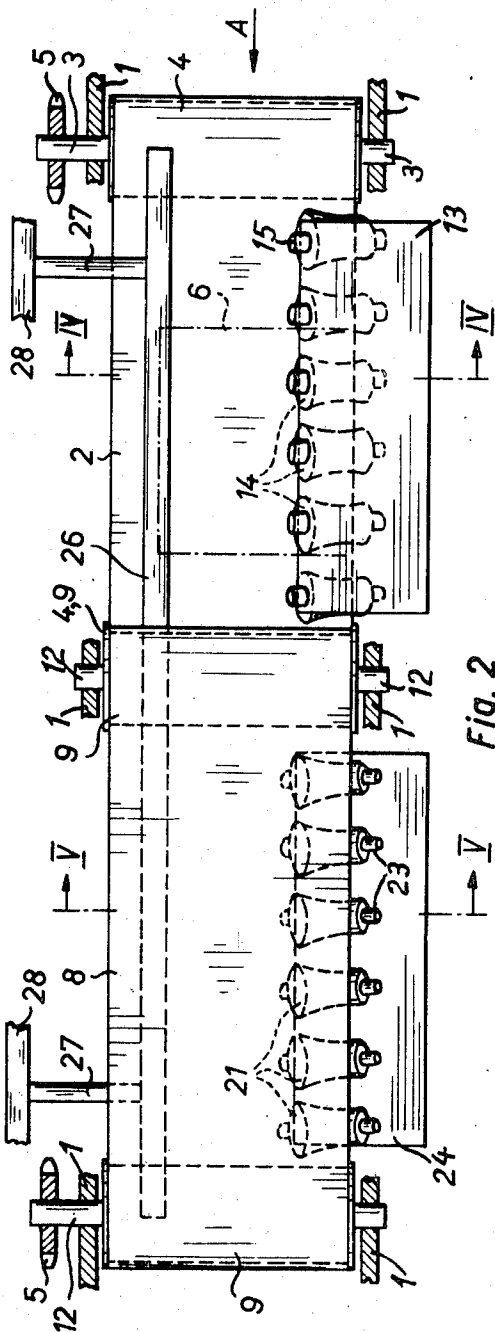


Fig. 2

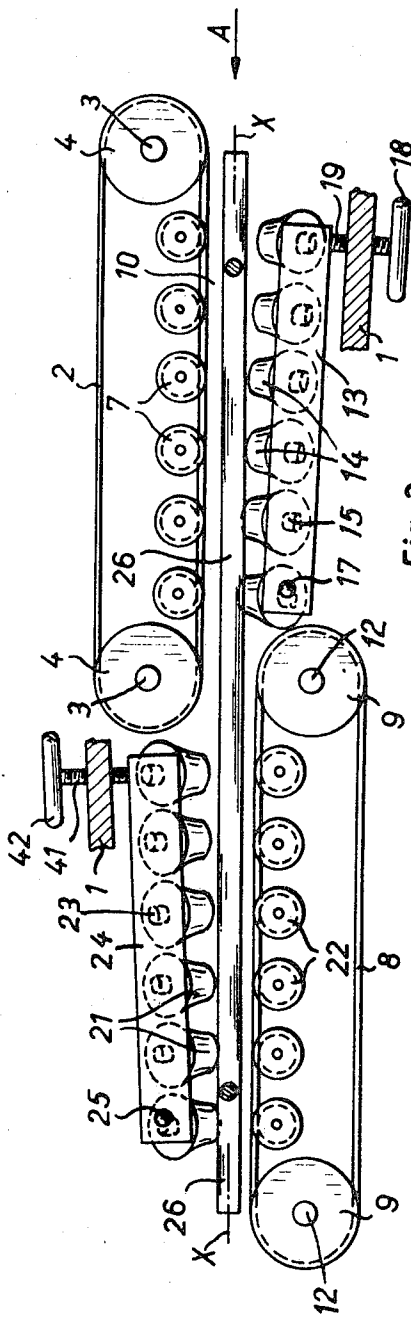


Fig. 3

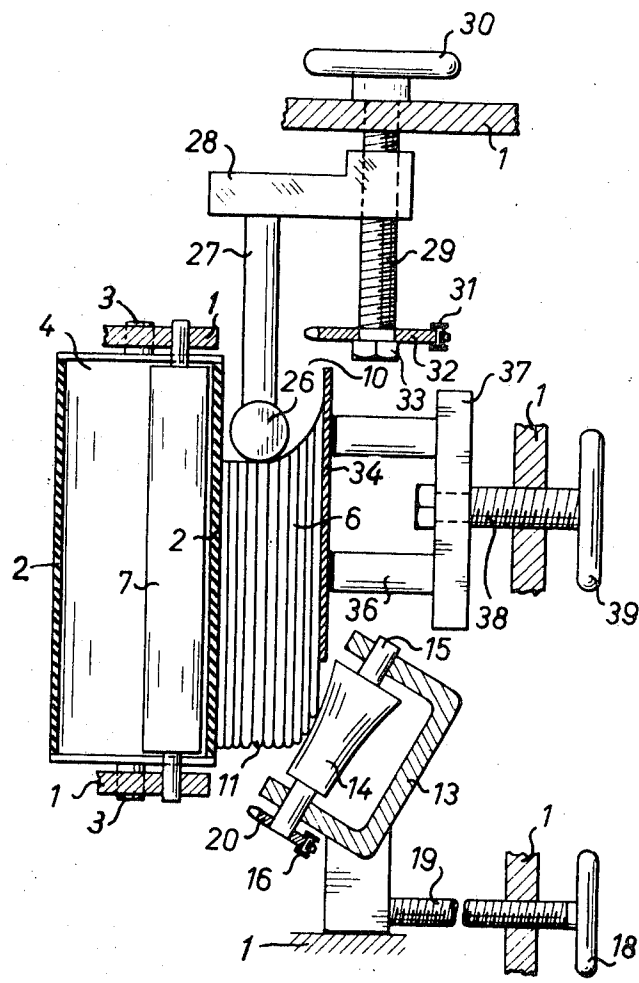


Fig. 4

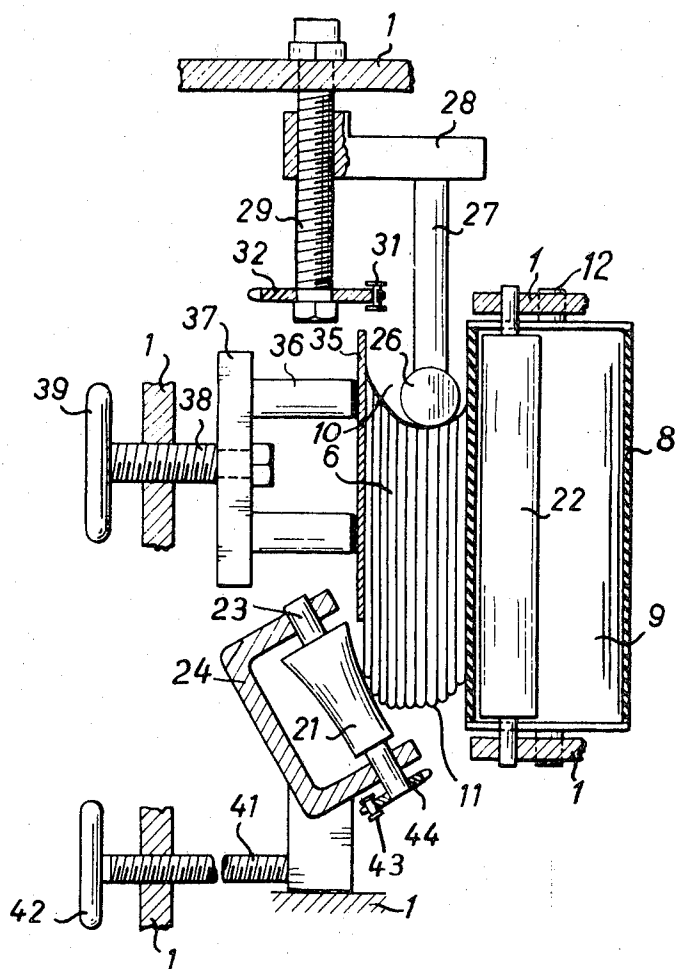


Fig. 5

METHOD OF ROUNDING THE BACKS OF BOOKS AND A MACHINE FOR PERFORMING THE SAME

BACKGROUND OF THE INVENTION

The invention relates to a new and improved method and machine for rounding the backs of books.

In the process of bookbinding the backs of the glued or sewn books must be rounded before they are inserted into their binding cases. Normally this is done by hand with a simple tool.

A method of rounding books already known in the art consists in pressing the backs of the books consecutively into the V-section peripheral grooves of a set of rolls which are intended to impart the necessary round to the backs of the books. However, in order to permit the necessary pressure to be applied to the backs of the books across the length of the backs, the books must be supported by a blade which is inserted into the middle of the book so that the book rides astride the blade. It has been found that this is not a satisfactory arrangement because a low pressure applied by the shaping rolls fails to produce the necessary round, whereas higher pressure may cause the blade to act as a knife and to cut the book in half.

Accordingly, it is a primary object of the present invention to provide a method of rounding the backs of books mechanically in a continuous process at relatively high speed.

Another object of the present invention relates to an improved machine for rounding backs of books so that the speed can be substantially increased over that possible with prior art machines.

A further object of the present invention relates to a rounding machine which can be rapidly adjusted to books of different formats and thicknesses.

It is another object of the present invention to provide a machine which is relatively simple in construction, extremely reliable in operation and has a high-output rate.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood, and objects other than those set forth above will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings, wherein:

FIG. 1 is a perspective view of a machine according to the invention,

FIG. 2 is a schematic side elevation of the machine,

FIG. 3 is a schematic view of the machine according to FIG. 1 in plan,

FIG. 4 is a section taken on the line IV—IV in FIG. 2,

FIG. 5 is a section taken on the line V—V in FIG. 2, and

FIGS. 6 and 7 are sections analogous to the sections in FIGS. 4 and 5, but showing a modified form of construction comprising coned shaping rolls.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The machine illustrated in FIGS. 1 to 5 comprises a frame 1 or casing containing a first endless conveyor belt 2 which runs over two return rollers 4. These return rollers 4 are mounted on vertical axes 3 supported by the frame 1. They are driven by a motor not shown in the drawings by a sprocket cooperating with a chain wheel 5. For supporting the conveyor belt 2 a plurality of vertical backing rollers 7 or supporting rollers are disposed between the two return rollers 4. The backing rollers 7 bear against the back of the flat conveyor belt 2 which may consist of rubber or a like material, and they prevent the belt 2 from being significantly flexed. A second endless rubber-elastic belt 8 similar to the first and mounted to run over two further return rollers 9 adjoins the first belt on the other side of the longitudinal axis X of a channel 10 along which books 6 are conveyed. This belt 8 is likewise supported by backing rollers 22 disposed on the back of the belt. The return rollers 9 are rotatably mounted on vertical axes 12 and the belt is likewise driven by a sprocket and chain wheel 5.

A substantially U-section beam 13 carries a first set of rotatable shaping or forming rolls 14. These shaping rolls 14 are substantially bell-shaped and they form a linear bank in direction A in which the books 6 are conveyed. However, the shaping rolls 14 could in the alternative also be cylindrical or tapering cones. The axes of rotation of the shaping rolls 14 are inclined to the horizontal at an angle between about 40° and 60°. They are spaced at appropriate intervals for each shaping roll 14 to face a backing roller 7. Each shaping roll 14 is rotatable on an inclined axle 15 and all the shaping rolls 14 are driven by a common chain 16. The entire beam 13 is swingable about a vertical hinge pin 17. A handwheel 18 and a screw shaft 19 permit the beam 13 together with its shaping rolls 14 to be pivoted about the pin 17 and thus advanced towards or away from the backs 11 of the books 6. The lateral distance of the shaping rolls 14 from the center of the conveying channel 10 becomes progressively less in conveying direction which is indicated by arrow A. Consequently the final roll 14 in the set will be closer to the vertical plane containing the longitudinal center axis X than the leading roll 14 at the entry end of the channel 10. The purpose of the shaping rolls 14 is to round successively one side or half of the backs 11 of the books 6 as they move or are transported along the conveying channel 10, in a manner shown in FIG. 4.

A like or similar shaping set for rounding the other side or half of the backs 11 of the books 6 adjoins the first set of shaping rolls in the direction of travel of the books 6 on the opposite side of the longitudinal center axis X. The lateral distance of these shaping rolls 21 from the longitudinal center axis X likewise decreases in the direction of travel A, i.e., towards the rear end of the machine. Each of the shaping rolls 21 of this second set again faces a backing roller 22. Hence the first section of the machine comprising the conveyor belt 2 extends from the entry end to roughly the midpoint of the conveying channel 10 and the second section comprising the conveyor belt 8 extends roughly from the midway point of the conveying channel 10 to the delivery end thereof.

The shaping rolls 21 which are likewise substantially bell-shaped are also inclined to the horizontal at an angle of about 40° to 60°, but in a direction contrary to that of the inclination of the first set of shaping rolls. The shaping rolls 21 are mounted on axes 23 which are rotatably supported in a U-section beam 24 and their purpose is to round the other side of the backs 11 of the books, in the manner shown in FIG. 5. This beam 24 is likewise swingable or deflectable about a vertical hinge pin 25 at the rear end of the channel 10. The two pins 17 and 25 are thus located on opposite sides of a vertical plane containing the longitudinal axis X. The beam 24 and hence the shaping rolls 21 can be moved by a handwheel 42 and a screw shaft 41. All the shaping rolls 21 are driven by a common chain 43 engaging a chain wheel 44 on one end of each axle 23.

At an adjustable distance above the shaping rolls 14, 21 is a horizontal bar 26 of circular section. This bar is located approximately in the center plane of the conveying channel 10 along which the books 6 travel. During the rounding or shaping process this bar 26 bears on the upwardly directed fore-edge of the books 6 on the side remote from their backs 11. The bar 26 ensures that the books 6 remain at the same level during their movement and during the rounding process along the channel 10. The bar 26 is supported from above by holders 27 and constitutes a reaction member which resists the shaping pressure of the rolls 14, 21.

At the top the holders 27 are each attached to a bracket 28 which is mounted on screw spindles 29. The bottom end of each screw spindle 29 carries a chain wheel 32, and all the chain wheels 32 are driven by a common chain 31 so that rotation of a handwheel 30 at the top of one of the screw spindles 29 causes like rotations of all the spindles 29 and a consequent horizontal upward or downward displacement of the bar 26 if books of other sizes are shaped.

Instead of a single continuous bar 26 two such bars could be arranged to adjoin in the direction of travel of the books along

the length of the channel, one bar being laterally slightly offset from the other.

Referring to FIGS. 4 and 5 it will be understood that the sides of the books facing away from the conveyor belts 2 and 8 are held by stationary metal sideplates 34, 35. The first elongated vertically disposed sideplate 34 extends approximately along the entire length of the first conveyor belt 2 and is situated above the shaping rolls 14, whereas the second sideplate 35 is roughly of the same length as the second belt 8 and is situated above the shaping rolls 21. The sideplates 34 and 35 have a smooth surface because the books 6 slide on these plates as they move along the conveying channel 10. For laterally supporting the sideplates 34, 35 they are arranged to bear against backing bars 36 or supporting beams held by thrust plates 37. The backing bars 34, 35 can be adjusted to books of different thicknesses by a screw spindle 38 which bears against the back of the thrust plate 37 and which is operable by a handwheel 39.

The described machine functions as follows:

A pile of unbound books 6 is placed on a slightly sloping feed table 53 (FIG. 1). The books 6 which may have been sewn or glued still have flat backs. The leading book in the pile is entrained by a floating chain, or drivers (which are not shown in the drawing) and which are attached to an endless chain extending along the conveying channel 10, and thus fed into the conveying channel 10. In this channel 10 the books 6 are consecutively gripped by the conveyor belt 2 and carried forward by the relatively high friction between the belt 2 and the sides of the books. The books 6 are thus one after the other consecutively advanced into contact with the shaping rolls 14. The leading shaping rolls 14 first push the outermost leaves or sections of the book slightly upwards. The next shaping rolls 14 then push the next leaves or sections upwards, the consecutive action of the shaping rolls thus progressively forming a permanent round on one side of the back 11 of the book 6. The half-rounded book 6 then enters the channel defined by the second conveyor belt 8 in which in analogous manner the other side of the back 11 of the book is similarly rounded by the shaping rolls 21. The books are held and guided at the same level during the rounding process by the bar 26 which constitutes a counterpressure against the upwardly directed forces exerted by the rolls 14, 21 on the books. Finally the books 6 that have been provided with fully rounded or shaped backs 11 are ejected at the delivery end of the machine and can be transferred to further processing machines. Preferably the shaping rolls 14, 21 are so driven that their peripheral speed in the region where they make contact with the backs 11 of the books 6 slightly exceeds the forwarding speed of the books 6 through the conveying channel 10, so that the rolls 14, 21 will assist in conveying the books 6 through the machine.

Adjustment to books of different thicknesses can be effected by advancing or retracting the sideplates 34, 35 in parallel. Adjustment of the elevational position of the bar 26 permits the machine to be adapted to books of different formats. The position of the shaping rolls 14, 21 can be adjusted by the handwheels 18, 42 to produce a rounding on the backs 11 of the books 6 of desired convexity.

FIGS. 6 and 7 illustrate a machine in which the cylindrical or bell-shaped shaping rolls 14, 21 are replaced by conical rolls 48, 50. These rolls have horizontal axes 49, 51 each carrying a chain wheel driven by a common chain or through a gear train. The conical rolls 48, 50 are likewise mounted in swingable beams which correspond to the beams 13, 24 in the previous embodiment. Otherwise these rolls and machine function in the same way as the previously described bell-shaped rolls.

A second rounding unit of substantially the same construction as that herein described could be combined with the described unit in tandem, particularly for books that are very fat, so that the complete machine would comprise four conveyor belts instead of only two and a corresponding number of sets of shaping rolls.

It should be apparent from the foregoing detailed description, that the objects set forth at the outset to the specification have been successfully achieved.

Accordingly, I claim:

1. Method of rounding the backs of books comprising the steps of

moving the books along an essentially straight, predetermined path;

supporting the backs of the books laterally at one side thereof;

progressively increasingly applying rounding pressure in a direction towards the support of the backs of the books and rounding a side of the supported, initially flat backs of said books as they travel along said path by engaging the backs of the books from progressively decreasing distance with respect to the median central plane of the books with a plurality of shaping rolls in a direction lengthwise of the backs during movement of said books along the first portion of said aligned predetermined path; then supporting the backs of the books laterally at the opposite side;

and thereafter progressively increasingly applying rounding pressure in a direction towards the support at the other side of the backs of the books and rounding the other side of the backs of said books by engaging the backs of the books from progressively decreasing distance from the other side with respect to the median central plane of the backs with a plurality of further shaping rolls during the movement of said books along a second portion of said aligned predetermined path.

2. Machine for rounding the backs of books comprising frame means;

conveying means mounted on said frame means for advancing the books sequentially along a unidirectional predetermined path in said machine in a direction parallel to the backs of said books;

a first set of driven shaping rolls operating on one side of the median central plane of said path for rounding one side of the backs of said books as they move along said path, said shaping rolls engaging the books with decreasing distance with respect to said median central plane as the books move along said path;

a second set of driven shaping rolls operating on the other side of the median central plane for rounding the other side of the backs of said books as they continue to move along said path, said other set of shaping rolls engaging the books with decreasing distance with respect to said median plane from the other side, as the books move along said path;

said first set of shaping rolls and said second set of shaping rolls being arranged, one behind the other in the direction of movement of said books; and

backup means located with respect to said rolls to counteract pressure from said shaping rolls against the books.

3. Machine as claimed in claim 2, wherein each of said sets of shaping rolls is mounted on a beam, said beam being pivotally mounted about vertical pin means fixed on said frame means, the distance between the first one of said rolls and the last one of each of said sets relative to the corresponding conveyor belt decreasing successively.

4. Machine as claimed in claim 2, wherein said conveying means comprise at least two endless conveyor belts having a high coefficient of friction in contact with paper material, and roller means rotatably mounted on said frame means for guiding and returning said conveyor belts, and wherein the backup means comprises backing roller means arranged at the inside of said conveyor belts for supporting the conveyor belts along said path.

5. Machine as claimed in claim 4, comprising further stationary sideplates fixed on said frame means facing each of the conveyor belts so that said books are pressed along said path between one of said conveyor belts and one of said sideplates, adjustable means for laterally adjusting said sideplates, one of

5

said conveyor belts extending substantially from one end of said machine to the middle part of said machine and the other of said conveyor belts extending from the middle part to the other end of said machine.

6. Machine as claimed in claim 2, wherein the backup means comprises at least one supporting bar extending along said path for supporting the fore-edge of said books during rounding the back of said books, said supporting bar having a curved underside.

7. Machine as claimed in claim 6, wherein said supporting bar extending substantially along the entire length of said path and being elevationally adjustable by adjusting means.

6

8. Machine as claimed in claim 2, wherein said shaping rolls are substantially bell-shaped, the axis of rotation of said rolls being inclined to the horizontal.

9. Machine as claimed in claim 1, wherein said shaping rolls are substantially cone-shaped, and the axis of rotation of said rolls being substantially horizontal.

10. Machine as claimed in claim 2, wherein the shaping rolls are driven such that the peripheral speed of said shaping rolls in the region touching the backs of said books exceeds the speed of travel of said conveying belts, the sense of rotation of said rolls assisting the movement of said book along said path.

* * * * *

15

20

25

30

35

40

45

50

55

60

65

70

75