April 16, 1963 H. BIEL ET AL 3,085,265

APPARATUS FOR PRODUCING BOOKLETS

Filed Dec. 6, 1960 3 Sheets-Sheet 1

FIG. 1

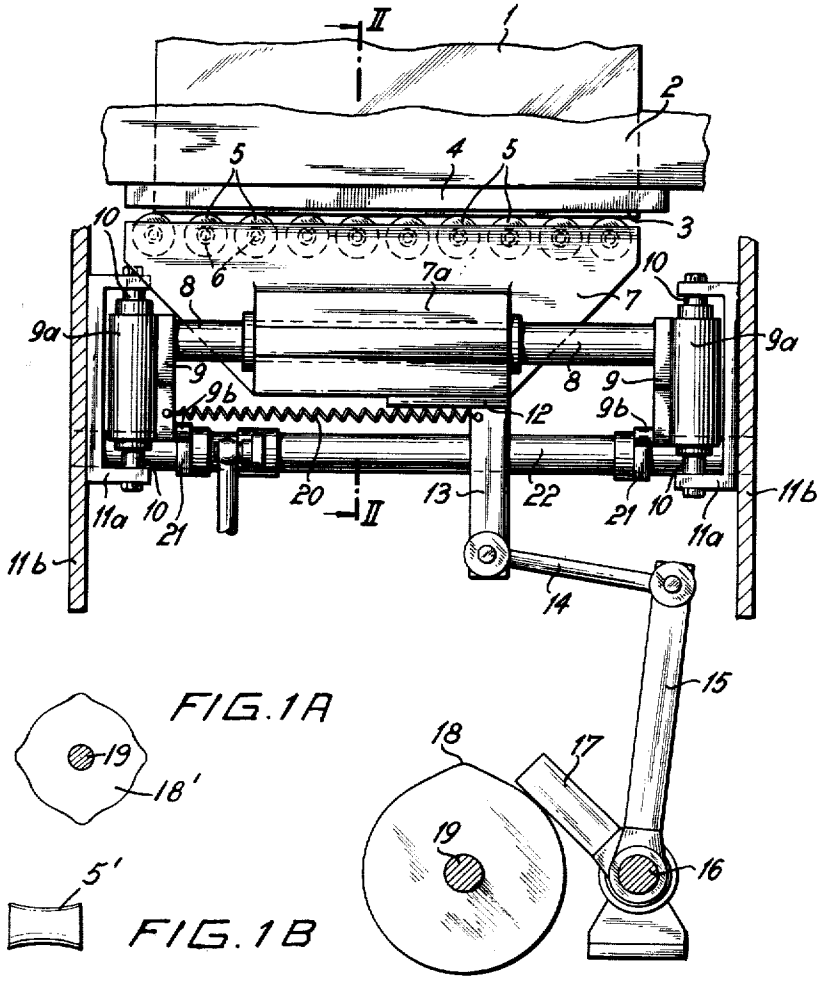


FIG. 1A

FIG. 1B



FIG. 1C

INVENTORS

HANS BIEL

HANS HORNUNG

BY

Hamess Dickey & Pierce

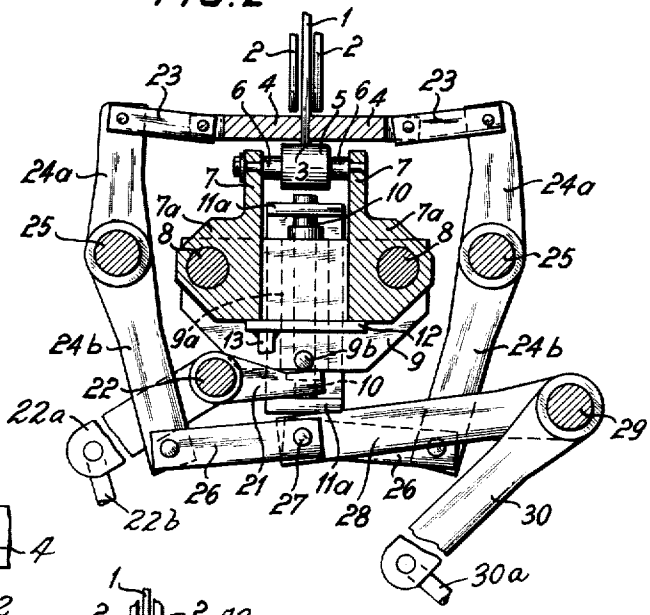
ATTORNEYS

April 16, 1963 H. BIEL ET AL 3,085,265

APPARATUS FOR PRODUCING BOOKLETS

Filed Dec. 6, 1960 3 Sheets-Sheet 2

FIG. 2



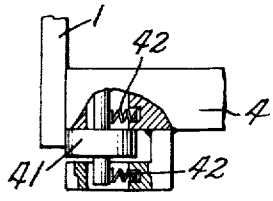
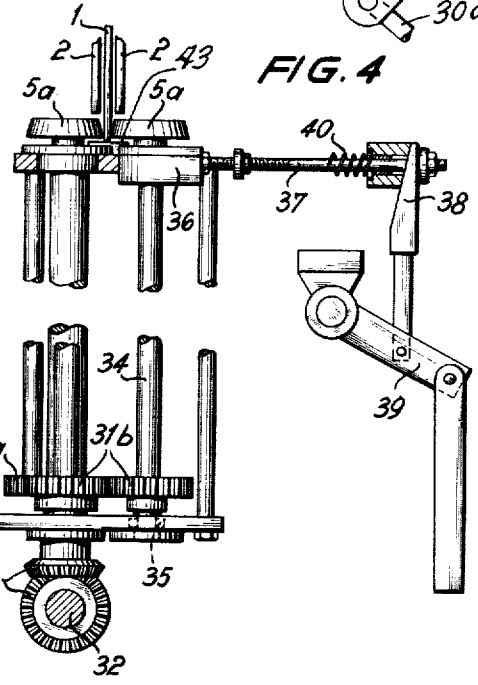


FIG. 2A

FIG. 4



INVENTORS

HANS BIEL

HANS HORNUNG

BY

Hamman, Dickey & Pierce

ATTORNEYS

April 16, 1963 H. BIEL ET AL 3,085,265

APPARATUS FOR PRODUCING BOOKLETS

Filed Dec. 6, 1960 3 Sheets-Sheet 3

FIG. 3

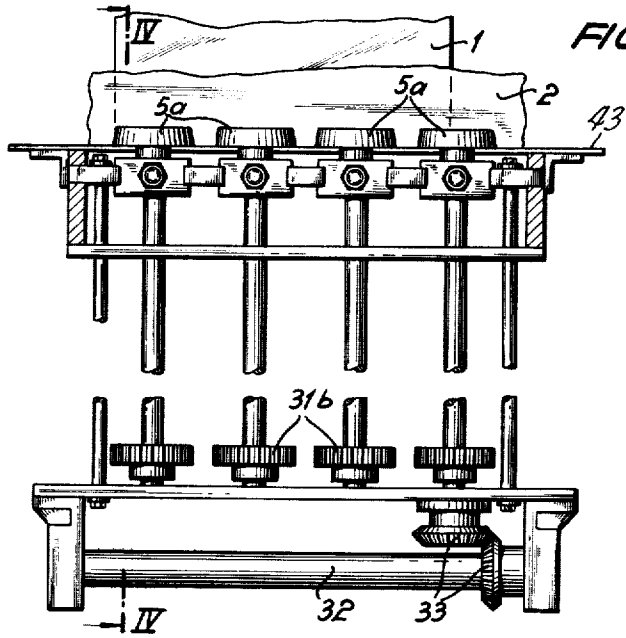
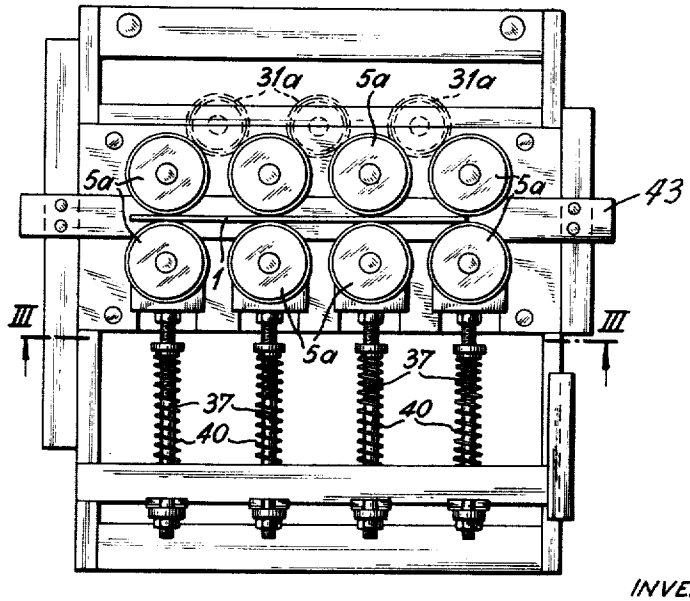


FIG. 5



INVENTORS
HANS BIEL
HANS HORNUNG
BY
Hamen, Dickey & Pierce
ATTORNEYS

United States Patent Office 3,085,265 Patented Apr. 16, 1963

3,085,265

APPARATUS FOR PRODUCING BOOKLETS

Hans Biel, Neuffen, Wurttemberg, and Hans Hornung, Beuren, Wurttemberg, Germany, assignors to Hans Sickinger, Bloomfield Hills, Mich.

Filed Dec. 6, 1960, Ser. No. 74,191
Claims priority, application Germany Dec. 10, 1959
4 Claims. (Cl. 11—1)

The present invention relates to an apparatus for producing booklets, pamphlets, or the like, and more particularly to apparatus for preventing the folded edge portions of booklets from springing apart and bulging. This bulging of the parts adjacent to the folded edges is very undesirable during the trimming, stacking, packing, and shipping of booklets since the booklets will then not lie exactly in alignment with each other, will be trimmed unequally and unevenly, and will take up more space than necessary. Also for the sale and use of the individual booklets it is very desirable that the leaves thereof will lie flatly on each other. This springing-apart and bulging of the folded edge portion of the booklets cannot be simply overcome by compressing the individual booklets or a stack of booklets for a short length of time. It has therefore been necessary prior to this invention to hold the stacks of booklets compressed for a considerable length of time and then to trim them in an operation separate from the preceding manufacturing steps. Obviously, this requires additional time, work, and space, apart from the fact that the finished booklets do not have the desired appearance since, after being trimmed, the folded edges of the finished booklets will again spring apart so that a stack of the then uncompressed booklets will take up more space and the leaves of each booklet will shift relative to each other, and the trimmed edges thereof will no longer be in a straight alignment with each other.

It is the principal object of the present invention to provide an apparatus for preventing this springing-apart and bulging of booklets near the folded edges, and for doing this in an operation which may be carried out consecutively with the other steps in the continuous course of production of the booklets.

Very generally speaking, this object will be attained according to the invention by subjecting the folded edges of the booklets to a rolling operation under pressure in a manner so that the leaves of each booklet will be deformed beyond the limit of their elasticity.

The objects, features, and advantages of the invention will become more clearly apparent from the following detailed description thereof, particularly when the same is read with reference to the accompanying drawings, in which:

FIGURE 1 shows a side view of the apparatus according to the invention;

FIGURE 1A shows a modified form of cam having multiple lobes;

FIGURE 1B shows a modified form of a roller having a peripheral surface curving inwardly in cross section;

FIGURE 1C is a still further modification of the roller showing an outwardly curved peripheral surface;

FIGURE 2 shows a cross section taken along line II—II of FIGURE 1;

FIGURE 2A is a fragmentary view similar to FIGURE 2 but showing a modified construction having additional rollers in staggered relation with those shown in FIGURES 1 and 2;

FIGURE 3 shows a side view of a modification of the apparatus, partly seen in a cross section taken along line III—III of FIGURE 5;

FIGURE 4 shows a cross section taken along line IV—IV of FIGURE 3; while

FIGURE 5 shows a plan view of FIGURE 3.

As illustrated in FIGURES 1 and 2 of the drawings, a booklet **1** consisting of a number of folded sheets is held between guides **2** in a vertical position so that the folded edge **3** faces downwardly. Closely adjacent to the folded edge **3**, rails **4** are provided on both lateral surfaces of booklet **1** which are adapted to be pressed toward each other for gripping the booklet. The folded edge **3** projects slightly from the lower edges of rails **4**.

Underneath edge **3** of the booklet a series of rollers **5** is mounted, preferably closely adjacent to each other. These rollers **5** are rotatably mounted on shafts **6** which are secured in a frame **7** which is adjustable in the longitudinal direction by means of flanges **7***a* which are slidable along guide rods **8**, the ends of which are secured at each side in a plate **9**, each of which is adjustable in the vertical direction by a flange **9***a* along rods **10** which are secured on parts **11***a* of the stationary main frame.

The adjustable frame **7** has secured to its lower side a plate **12** which is connected to an arm **13** which is pivotably connected at its lower end through an arm **14** to a lever **15** which is secured to a shaft **16**. A second lever **17** on shaft **16** engages with a cam plate **18** which is secured to a shaft **19** which is driven by a motor, not shown.

When the machine is in operation, each revolution of shaft **19** is transmitted by cam **18** and lever **17** to shaft **16** to rock the same, whereby, through lever **15** and arms **14** and **13**, frame **7** together with rollers **5** are moved along guide rods **8**. After the lobe of cam **18** has passed its point of engagement with lever **17**, all of the mentioned parts are returned to their original positions by a spring **20**. It is, of course, also possible to modify the mechanism so that rollers **5** will act repeatedly by several reciprocating movements upon the folded edge **3**, for example, by providing several cam lobes on the same cam plate **18**, as shown in FIGURE 1A at **18'**.

The distance of travel of rollers **5** corresponds approximately to the distance between the adjacent rollers. Thus, each roller **5** only rolls along a small portion of the folded edge **3** so that an excessive displacement of the outer parts of the folded edge **3** in the longitudinal direction thereof will be avoided.

For pressing the rollers **5** against the folded edge **3**, each plate **9** is provided with a stud **9***b* which is acted upon from below by an arm **21** which is secured to a shaft **22**. This shaft **22** which is rotatably mounted at both ends in frame parts **11***b* is driven by the motor of the machine by means of suitable connecting members such as levers, rods, cams, and the like, for example, lever **22***a* which is actuated by rod **22***b* to rotate shaft **22** counterclockwise so that, while rollers **5** roll along the folded edge **3**, they will be pressed against this edge and the sheets forming the booklet **1** will thus be deformed along the folded edge **3** beyond the limit of elasticity.

In order to insure that the deformation will be limited to the outermost edge **3** and that the paper fibers will there be displaced relative to each other to such an extent that the tensions produced by the folding will be overcome, each booklet **1** is compressed on its lateral sides closely adjacent to the folded edge **3** by the mentioned rails **4**. For this purpose, each rail **4** is connected by arms **23** to the upper arms of levers **24***a* which are pivotable about shafts **25** and the lower arms **24***b* of which are connected to arms **26** which are connected to each other to form a knuckle joint. The hinge pin **27** of this joint is connected to a tightening lever **28** which is secured to a shaft **29** which may be rotated by a lever **30**. By suitable connecting members, for example, rods, levers, cams, or the like, such as rod **30***a* which rotates lever **30** coun-

terclockwise, this lever **30** may be connected to the main drive of the machine in such a manner that, while rollers **5** roll along the folded edge **3**, rails **4** will be firmly pressed against each other.

Rollers **5** may be made of a width at least equal to the thickness of the booklet **1**. The peripheral surfaces of rollers **5** may be curved inwardly or outwardly in cross section as shown in FIGURES 1B and 1C in order to act upon the arrangement of the paper fibers in the most desired manner. If small rollers **5** are used which are spaced from each other and act upon the end surface of the folded edge **3**, additional rollers **41** shown in FIGURE 2A may be provided in a staggered relation and adjacent to rollers **5** and outwardly thereof so as to press upon the lateral surfaces of the folded edge **3**, for example, by means of springs **42**, in order to loosen and rearrange the paper fibers within the folded edge to a still greater extent. In other words, if the spacing between rollers **5** as seen in FIGURE 1 were sufficient, rollers **41** would be located within these spaces and between rollers **5**. Both rollers **5** and rollers **41** would act on edge **3**, rollers **5** acting upon the underside of edge **3** and rollers **41** acting upon the lateral surfaces of edge **3**. For purposes of clarity, rollers **5** are not illustrated in FIGURE 2A.

In the further embodiment of the invention, as shown in FIGURES 3 to 5, rails **4** and rollers **5** as well as their supporting structure are absent, and instead rollers **5***a* act upon the two lateral sides of booklet **1** adjacent to the folded edge **3**. Surface **43** of an elongated flat plate seen in FIGURE 5 acts on the underside of edge **3**. The peripheral surfaces of rollers **5***a* are slightly conical so that their outwardly facing edges will strongly compress the booklet closely adjacent to the folded edge **3** and deform the same so that the sheets will at these points lose their elasticity and will lie flatly on each other.

Rollers **5***a* of this embodiment of the invention may be connected to the machine drive so as to move booklet **1** in the longitudinal direction. For this purpose it is advisable to connect rollers **5***a* to each other by means of gears **31***a* and **31***b* so that only one of these gears needs to be driven by a drive shaft **32** and a pair of bevel gears **33**. While the rollers **5***a* which act upon one side of booklet **1** are mounted in a fixed position in the frame, shafts **34** of rollers **5***a* which are located at the other side of the booklet are mounted so as to be pivotable about self-aligning bearings **35** in order to permit booklets **1** to be inserted between the pairs of rollers **5***a* to be compressed thereby. For pivoting the adjustable rollers **5***a*, their upper bearings **36** are connected to rods **37**, the ends of which engage with tapered cams **38**, each of which may be shifted forwardly and backwardly by a lever **39** and be automatically controlled by the operation of the machine. Each rod **37** carries a spring **40** for returning rollers **5***a* to their original positions.

The method and apparatus according to the invention have the advantage that only a single short operation is required to insure that the booklets will no longer spring apart and bulge near the folded edge, and that they will no longer need to be stacked under pressure for a considerable length of time, for example, eight hours. The

rolling operation according to the invention may be interposed in the normal course of production of the booklets after they have been stapled and before their edges are trimmed by an edge-trimming mechanism. If the booklets, which after being folded always spring slightly apart, were to be passed to an edge-trimming mechanism without being subjected to the rolling operation according to the invention, a stack of such booklets would have a considerably greater height so that the trimming blades would have to have a longer stroke. Furthermore, the booklets within the stack would then not be in proper alignment with each other since the rounded folded edges of the individual booklets would not form accurate guide edges. Finally, the trimmed edges of the booklets would not be even since, after the trimming, the parts near the folded edges would again spring apart at least to some extent, so that the individual pages would shift relative to each other. If, however, the rolling operation is interposed between the stapling and edge-trimming operations, the rolled folded edges of the booklets will form accurate guide edges for the edge-trimming operation, and the trimmed edges of all the pages in each booklet will remain exactly flush with each other. It will thus be possible to produce booklets of a much neater appearance and within a considerably shorter time than previously.

Although our invention has been illustrated and described with reference to the preferred embodiments thereof, we wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed our invention, what we claim is:

1. An apparatus for the production of booklets and the like comprising a plurality of rollers and means for causing relative movement between said rollers and the folded edge of the booklet in a direction along said folded edge while exerting a pressure upon said edge, so that the sheets within said booklet will be deformed near said edge beyond the limit of their elasticity.

2. An apparatus as defined in claim 1, further comprising means for mounting said rollers closely adjacent to but spaced from each other.

3. An apparatus as defined in claim 1, further comprising means for clamping each booklet at the opposite sides therealong a line closely adjacent to said folded edge while said rollers are pressed against and are moved along said edge at substantially right angles to said sides.

4. An apparatus as defined in claim 1, in which said rollers have inwardly curved peripheral surfaces.

References Cited in the file of this patent

UNITED STATES PATENTS

1,543,378	Frazier	June 23, 1925
1,747,581	Frazier	Feb. 18, 1930
2,605,739	Florez	Aug. 5, 1952

FOREIGN PATENTS

818,935	France	Oct. 6, 1937