Nov. 28, 1950 F. J. CASHIN 2,531,841

DISK BLADE FOR TRIMMING BOOK BLOCKS

Filed June 16, 1948

Fig. 1

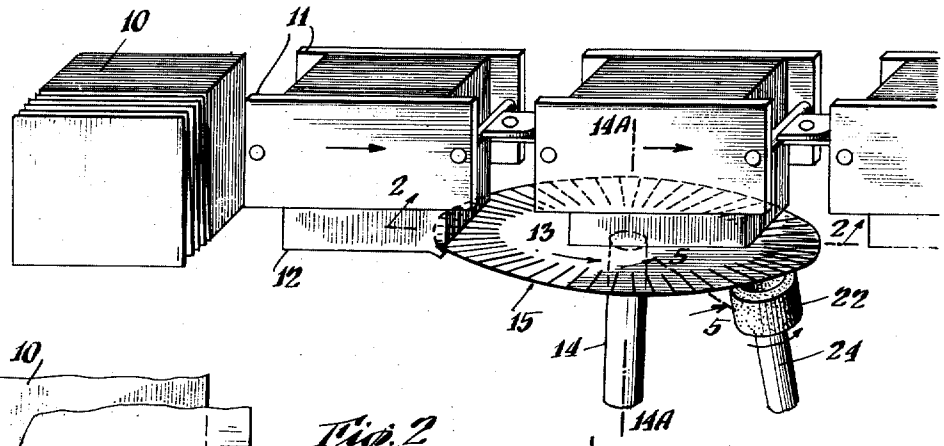


Fig. 2

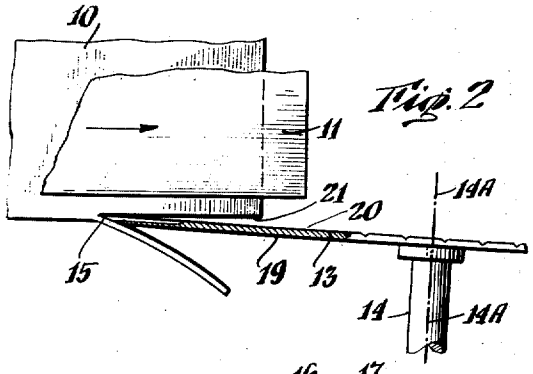


Fig. 4

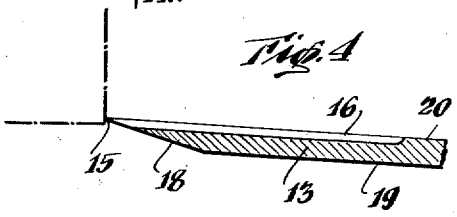


Fig. 3

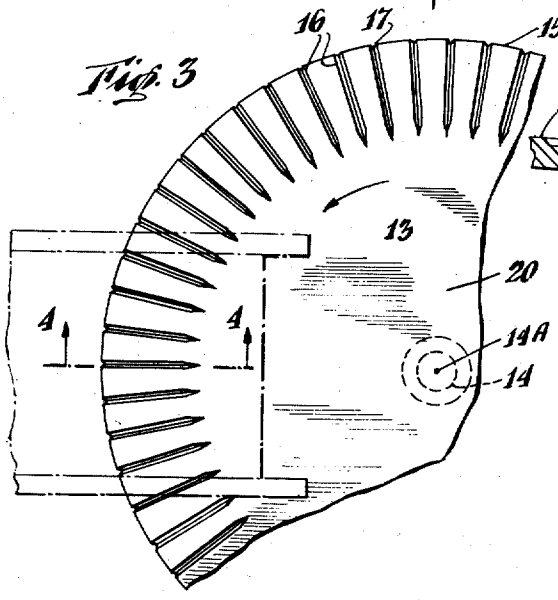
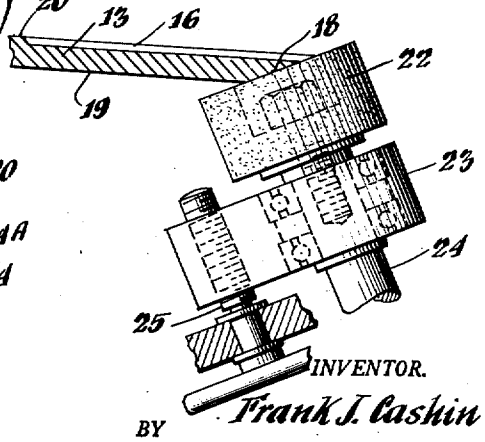


Fig. 5



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DISK BLADE FOR TRIMMING BOOK BLOCKS

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1 Claim. (Cl. 164—70)

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This invention relates to cutting apparatus, and particularly to apparatus designed for the cutting and trimming of the edges of book blocks in the manufacture of books. In the manufacture of plastic backed or other adhesively bound books and particularly in the manufacture of said books having a hard casing or cover, it is essential to prepare the binding edge of the book so that the edges of the individual pages lie in one plane. These trimmed edges must lie in one plane and the surface of this plane must be of such condition so as to permit the applied adhesive to penetrate and adhere to the cut edge of each individual leaf in the said book block. A principal object of this invention, therefore, is to provide a simple, efficient, and inexpensive apparatus for effecting a plane cut of suitable surface condition, in the cutting and trimming operations, in the binding of plastic bound books.

It may be explained that this invention provides a more efficient and dependable cutting service than is obtained with other cutting arrangements. Heretofore, cutters of the guillotine type have been extensively used for cutting and trimming the edges of assembled books, including the back edge. However cutters of this type, where the book block is held stationary under direct pressure and the cutting blade is forced through the block in a single powerful motion, are subject to two distinct deficiencies. This operation of holding the book block stationary while the cutter is forced through the book block is an operation poorly adapted for inclusion in a continuous or other desirably rapid process, such as described and claimed in the copending application of Luis de Florez, Peter de Florez and Owen L. Gore, Serial No. 24,494, filed May 1, 1948. In addition, the resulting transverse surface obtained by the cut is excessively smooth, and indeed of a glazed or glossy character, which is, it has now been found, relatively unsatisfactory for an adhesive plastic binding. Although a moderately smooth surface is desirable in many cases, there should be opportunity for the applied adhesive to penetrate and adhere to the cut edge of each individual leaf in the said book block, and hence preferably some provision for control of the smoothness of the cut. Generally speaking, cutters of the guillotine type are incapable of adjustment or change to provide anything less than an extremely smooth cut and are ill adapted for inclusion in a continuous or otherwise desirably rapid process. A further object of this invention, therefore, is to provide a cutting and trimming apparatus that may suitably

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be included in a continuous process and in addition will give a transversely cut surface suitably conditioned to permit application of an adhesive in the binding of plastic backed books irrespective of the type of paper used.

Cutters of the ordinary rotary type are in use at the present time and while they are not subject to the deficiency of being ill adapted to use in a continuous process, they have been found to be unsatisfactory in use upon certain types of paper. When cutters of the said ordinary rotary type have been used with certain types of hard or abrasive papers, it has been found the ordinary rotary knife will build up a tremendous pressure in cutting and will, as a consequence of such pressure, deflect upward or downward and thus cause the cut surface to deviate from a plane.

In addition, evidence has shown that the surface produced by the ordinary rotary knife is subject to the same deficiencies, though to a lesser degree than the surface produced by the above mentioned cutters of the guillotine type, of giving an excessively smooth cut across the leaves or otherwise preventing the attainment of a uniform, square exposure of each leaf edge, suitable for the adhesive.

The problem of maintaining a suitably sharp edge for a rapidly moving cutting device is peculiarly acute in book manufacture, i. e. in that many book papers have a relatively large content of mineral coating or filling material, which is apt to dull a knife or other device quite rapidly. Hence another object of this invention, in addition to the objects of providing a simple, efficient inexpensive apparatus for effecting a plane cut of a surface condition suitable for the application of adhesive irrespective of the type of paper used, and thus suitable for use in a continuous process of binding books with plastic or other adhesive, is to provide a cutter which is adapted to be sharpened without interruption of said continuing process.

While the apparatus was especially designed for the use of cutting the edges of a book block in the manufacture of plastic bound books, it may be used as a cutting instrument in other systems and for other purposes, within the scope of the appended claim.

Referring to the drawings:

Fig. 1 is a schematic perspective view of the apparatus as included in a continuous process for the binding of books;

Fig. 2 is a side view of the apparatus with cer-

tain parts cut away, or in section generally on the line 2—2 of Fig. 1;

Fig. 3 is a top plan view of a fragmentary portion of the apparatus;

Fig. 4 is a vertical section, with certain parts cut away on the line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary vertical section with certain parts in elevation, generally on line 5—5 of Fig. 1.

Fig. 1 illustrates the cutter as it would be utilized in a continuous process in the binding operation in the manufacture of books. The pages to be included in the final form of the book are assembled in the proper sequence to form the book block 10. The book block 10 therefore consists of a multiplicity of leaves, assembled after the printing and gathering stages, with the individual leaves in the proper sequence, and assembled in such a manner as to have the respective edges of said book block 10 approximating plane surfaces. These book blocks may, for instance, be an assemblage of individual signatures, each consisting of 4, 8, 16, 32 or other usual number of leaves, may be an assemblage of leaves gathered together in an accordion fold (as here shown), or may be an assemblage of individual, completely detached leaves.

Although other means of holding and transporting the book block 10 may be utilized, a convenient arrangement is to engage it in a clamp 11 which acts compressively on opposite faces of the block so as to leave the edges, particularly the back edge 12 accessible for further operations. Preferably, too, the same clamp can be employed to hold the block through at least many, and indeed practically all of the succeeding steps in said continuous process and the clamp may also serve to transmit motive power to the block as it moves through successive operations.

With the book block 10 firmly being held in the clamp 11, the block is then advanced to the rotary cutting blade 13. The rotary cutting blade 13 consists of a thin disk of suitably rigid material rigidly connected to and rotating about a fixed predetermined axis 14*a*. As the book block is advanced the cutting edge of the rotary cutting blade meets the book block 10 at a point determined by the mutual positional relationship of the blade and the book block as held in the clamp 11. The rate of the cut through the book block 10 is determined by the speed of the book block 10 as it moves in a fixed path across the rotary cutting blade 13.

Figures 2, 3 and 4 show the detailed construction of the rotary cutting blade 13 together with its position and mounting with respect to a book block 10 undergoing the cutting operation.

Figure 3 is a top plan view of said rotary cutting blade 13. Said blade 13 consists of a circular disk of rigid material, e. g. hard or hardened steel, securely fastened to and rotating in conjunction with an accurately positioned shaft 14. The shaft 14 is rigidly constructed of a suitable material such as steel and is carefully positioned so as to rotate about axis of rotation 14*a*. Said blade 13 and shaft 14 must be so constructed and secured so as to permit little or no deviation from the axis of rotation 14*a* despite the great pressures developed when cutting through a book block 10. The cutting edge 15 of the blade 13 is formed by a bevel 18 on the underside 19 of the blade—Fig. 4 showing in detail this bevelled surface.

The upper surface 20 of the blade 13 contains a plurality of V-shaped slots 16 embedded on said surface 20. These slots 16 are radially positioned on the upper surface 20 and extend to the cutting edge 15. The intersection of the slots 16 with the bevelled cutting edge 15 forms an indentation or notch 17. These notches 17 together with the unindented sections of cutting edge 15 form alternate indented and unindented cutting surfaces which in effect give a total cutting edge with a special saw-like character. More specifically, these slots 16 perform a triple function. In conjunction with the cutting edge 15, the slots provide a cutting edge of alternate indented and unindented sections. In the first place this type of cutting edge leaves the surface of the severed edge of the book block 21 (see Fig. 2) in a condition suitable for the application of an adhesive, without any modification. The surface is of the required degree of smoothness for the adhesive to penetrate and adhere to the cut edge of each individual leaf in the said book block 10. In the second place these slots 16 provide for a relief of the pressures built up as the cutting edge 15 traverses book block 10, which pressures normally tend to cause a deviation from a plane cut with the standard type of rotary cutter; thus the device assures a plane cut, irrespective of the type of paper in the book block 10. In the third place the slots 16 because they are V-shaped avoid clogging of the cutter in operation.

Fig. 2 shows in detail the rotary cutting blade 13 cutting through a book block 10. It is to be noted that the axis of the shaft 14 is positioned so that the plane of rotation of the cutting blade 13 is inclined slightly, e. g. of the order of a few degrees, from the plane of motion of the book block 10. The purpose of this inclination of the cutting blade 13 and the shaft 14 is to prevent possible binding of the cut surface 21 of the book block 10 on the upper surface 20 of the blade 13 and to avoid possible deformation of the cut edges of the leaves, and also to provide clearance for any projecting means (not shown) if the latter is necessary or desired in the structure securing the blade to the shaft 14. Thus the book block is wholly clear of the underlying parts as it moves across said upper surface 20 on its way to the next step in the process. The angle of inclination of the blade is sufficiently small to avoid interference with the attainment of desired smoothness in the trimmed surface of the book.

Fig. 4 presents, in detail, a side view of the cutting edge 15 of the blade 13, showing the slot 16, the cutting edge 15 and the bevel 18 upon the under side 19 of the blade.

Fig. 5 shows in detail the means for sharpening the cutting edge 15 of the blade 13 by a suitable grinding mechanism while in operation. A grinding wheel 22, e. g. of cylindrical shape is mounted on a shaft 24, to be driven thereby, removably positioned by a bearing assembly 23, so that the plane annular grinding surface of the wheel 23 may be brought in contact with the entire radial dimension of the bevelled surface 18 and the cutting edge 15 of the blade 13. The grinding wheel 22, the shaft 24 and the bearing assembly 23 may be moved in a direction parallel to the axis of rotation of said wheel 22 and shaft 24 by manual operation of positioning mechanism such as the lead screw 25, thus permitting grinding of the entire bevelled surface including the edges of each notch as well as the circular edge, whenever necessary, without interruption of continuous operation. It will be understood that during the intervals in which the rotating

wheel 22 is held in grinding position, the bevelled edge 18 makes contact with the plane annular surface of the wheel 22 at only one side or chord of the annular path of such surface.

By way of specific example, with an arrangement as shown in Figs. 2, 3 and 4 very satisfactory results have been obtained under the following conditions:

Diameter of the rotary cutting blade 13, 18 to 22 inches

Speed of rotation of the rotary cutting blade 13, 1200 R. P. M.

Thickness of the rotary cutting blade, 9/64 inch

Bevel 18 at the cutting edge 15, approximately 20°

Radial V-shaped slots 16, approximately .010 inch in depth and approximately ½ inch apart at the periphery of the disk

The illustrated structure is at present believed to be peculiarly effective, and therefore preferred, for use in book manufacturing operation.

I claim:

Cutting apparatus adapted for the purpose described comprising a thin, rigid disk having its periphery bevelled on one side to provide a sharp, circular cutting edge, and having a multiplicity of shallow spaced grooves, each extending in a radial direction for a substantial distance toward the center of the disk beyond the bevel and of V-cross-section, said grooves being formed in the other side of the disk and intersecting said cutting edge and bevelled periphery to provide a plurality of indented portions spaced apart around said periphery.

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