

April 14, 1953

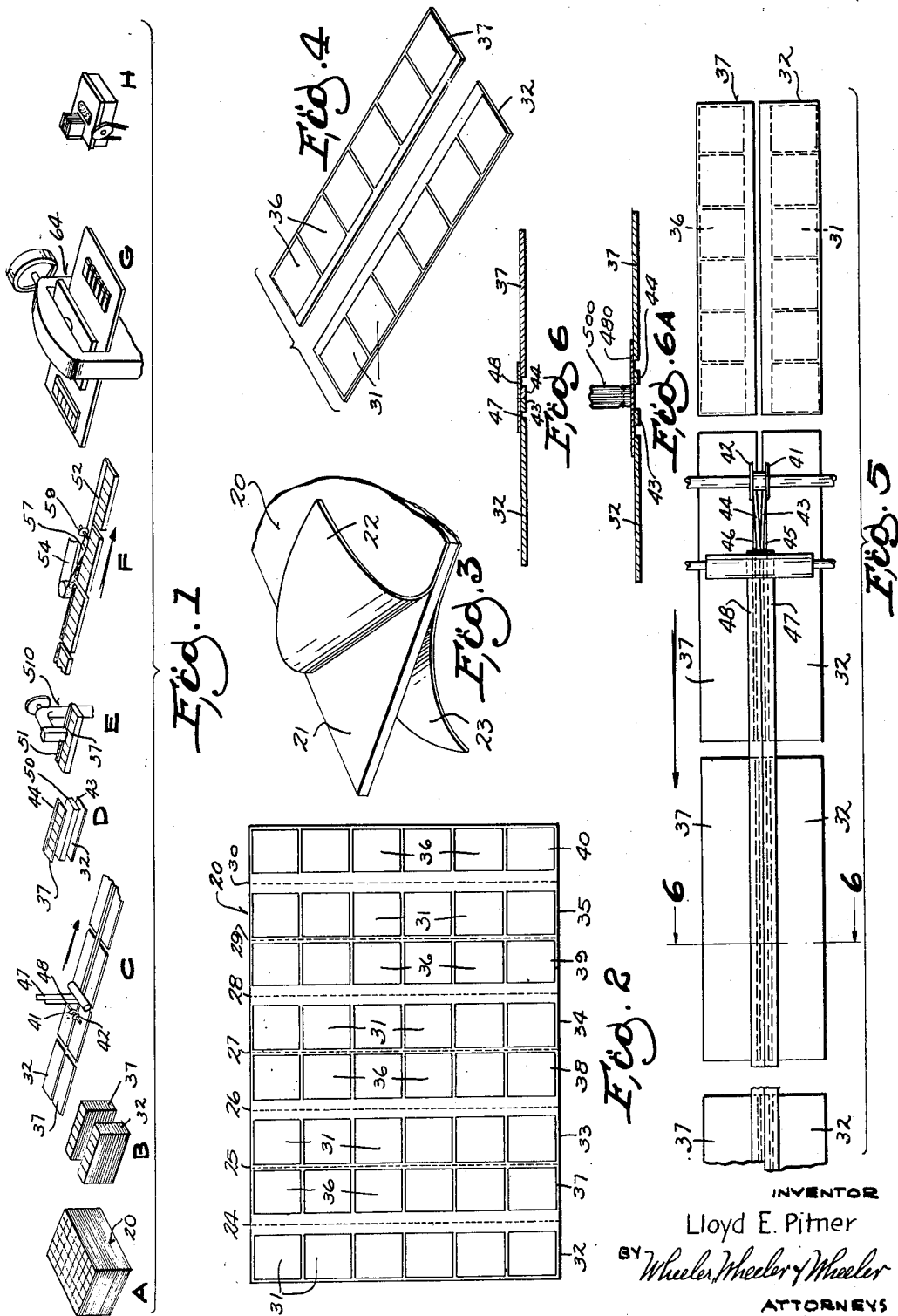
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2,634,438

MACHINE FOR APPLYING BINDING TAPE TO BOOKS

Original Filed April 3, 1947

5 Sheets-Sheet 1



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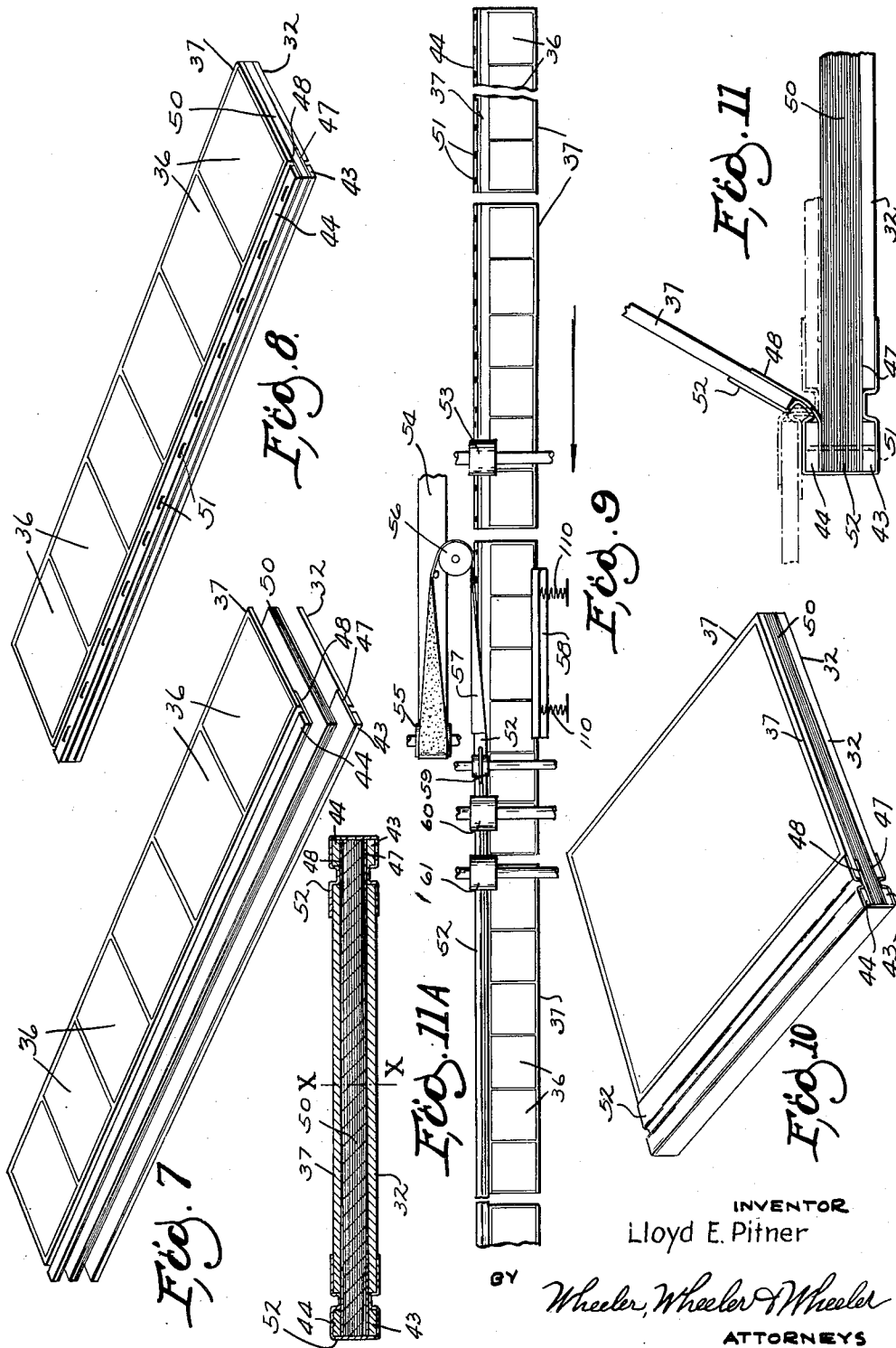
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MACHINE FOR APPLYING BINDING TAPE TO BOOKS

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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

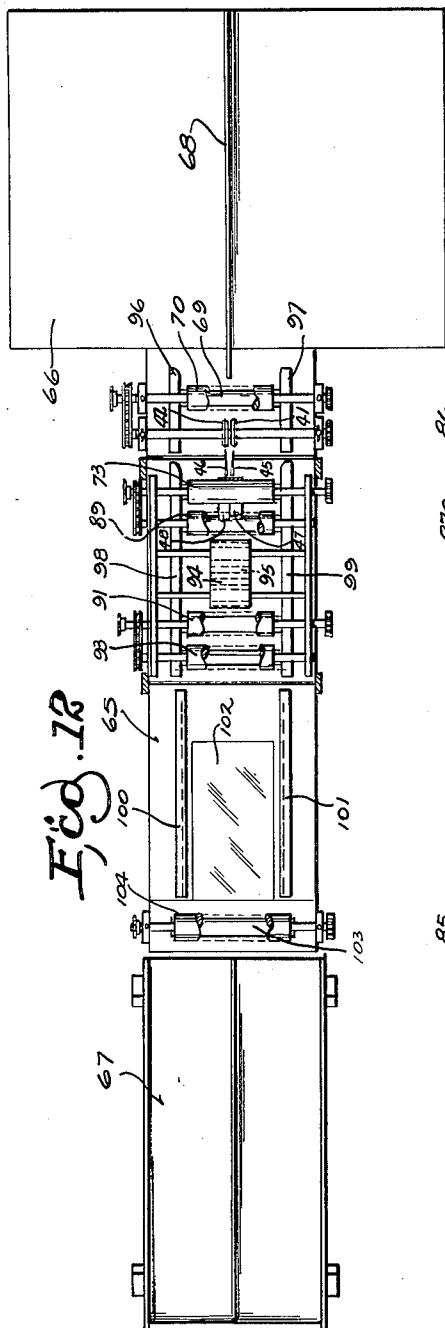


Fig. 12

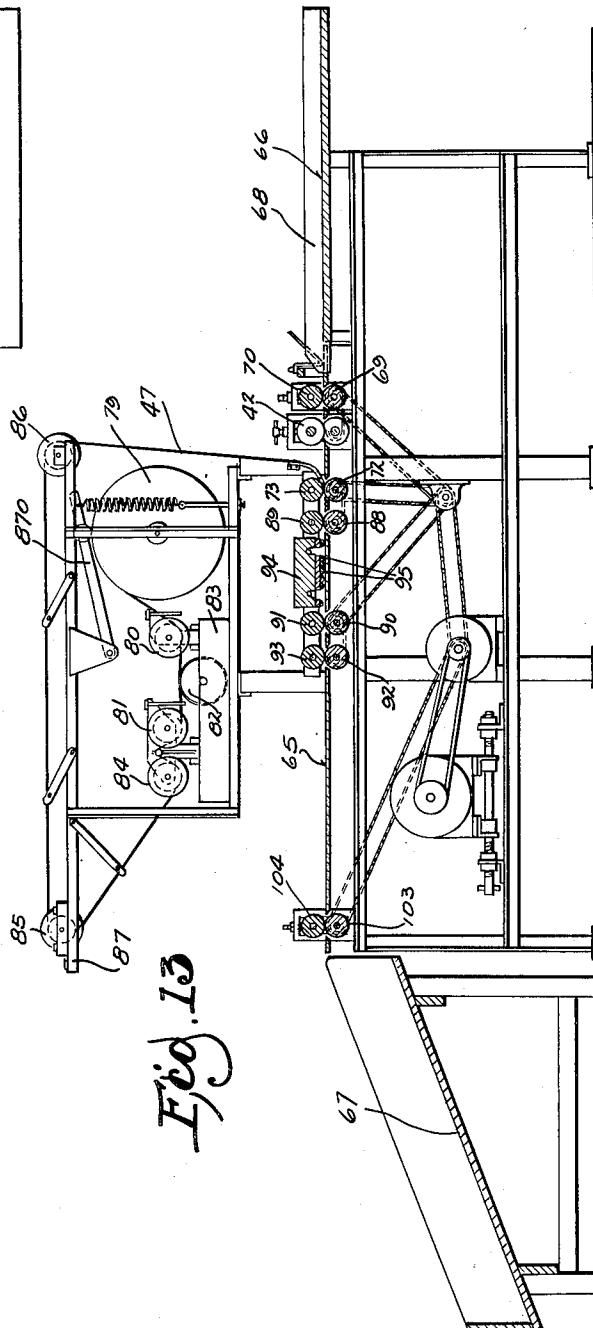


Fig. 13

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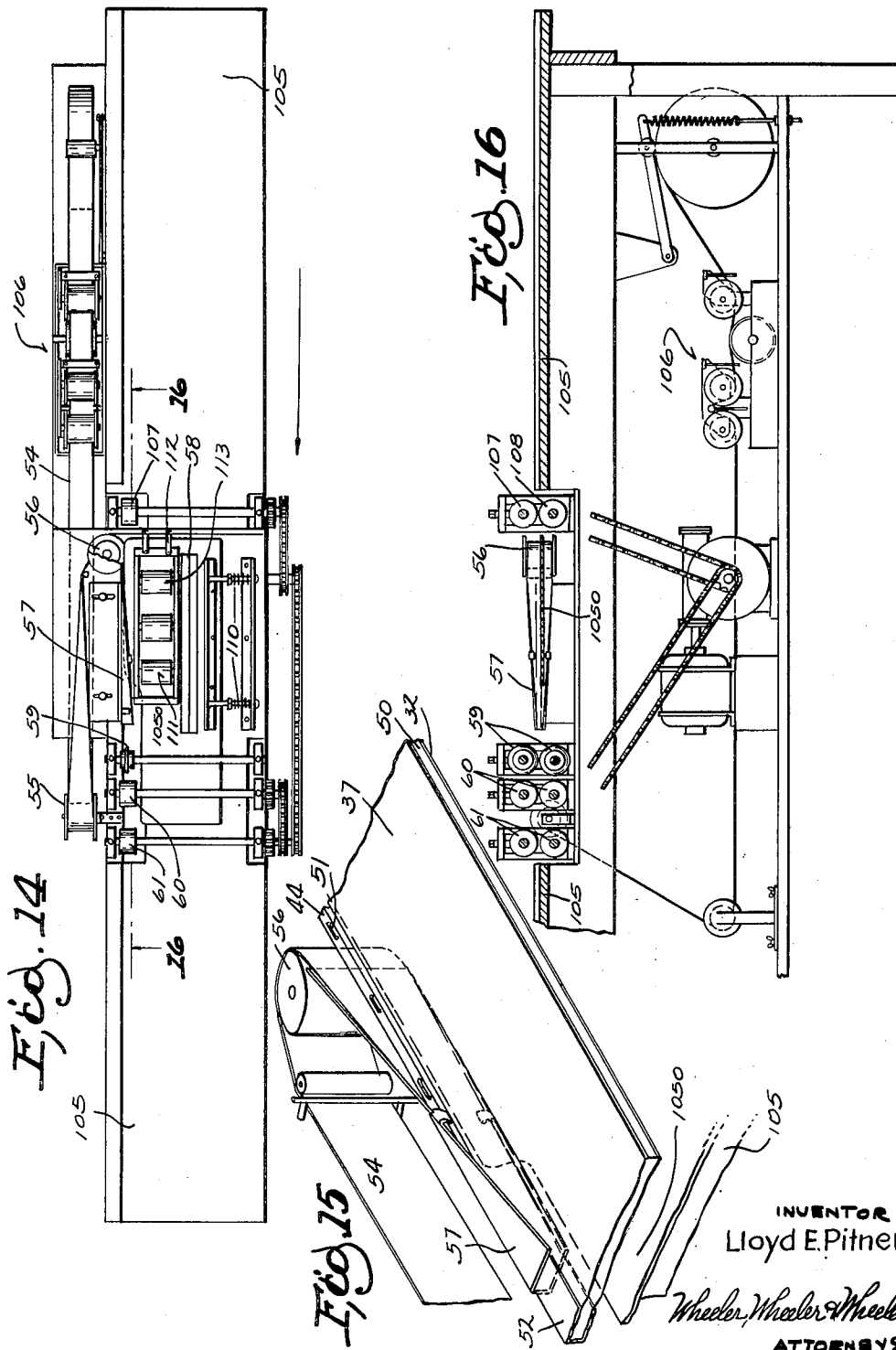
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MACHINE FOR APPLYING BINDING TAPE TO BOOKS

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5 Sheets-Sheet 5

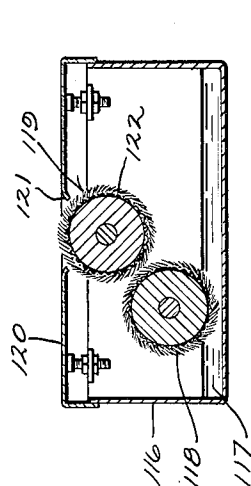


Fig. 18

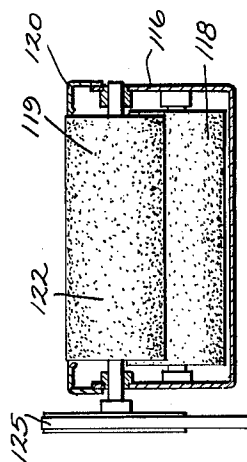


Fig. 19

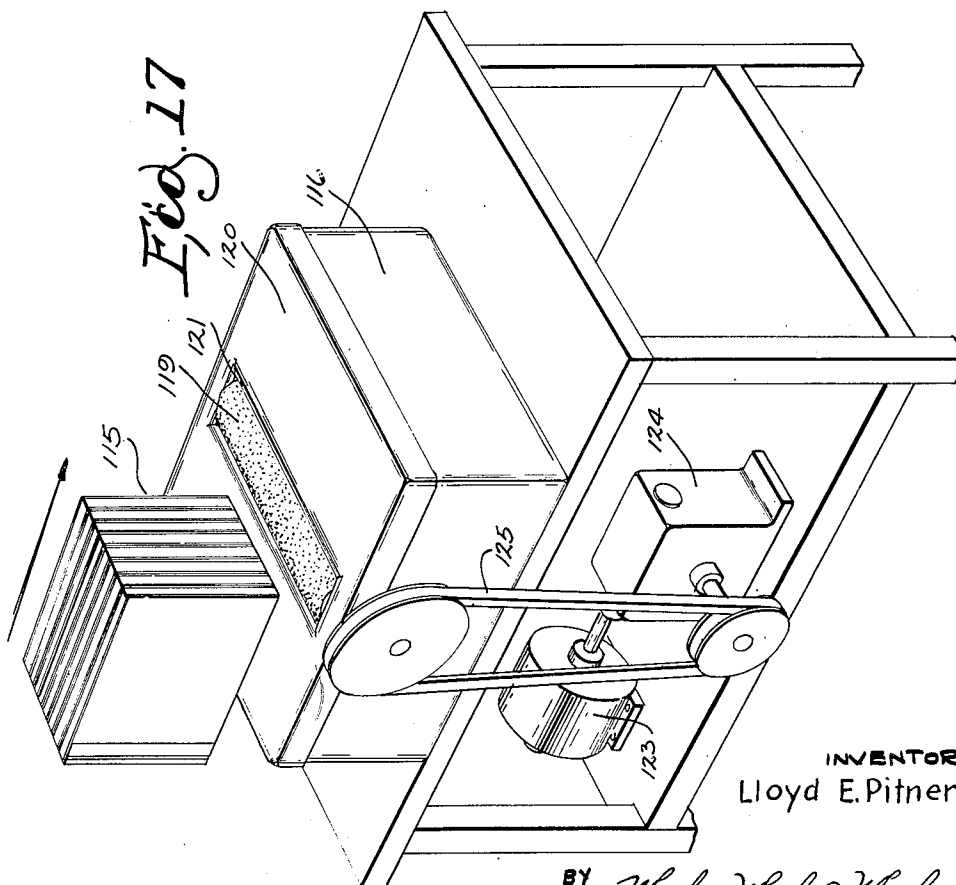


Fig. 17

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2,634,438

MACHINE FOR APPLYING BINDING TAPE
TO BOOKS

Lloyd E. Pitner, Milwaukee, Wis.

Original application April 3, 1947, Serial No.
739,165. Divided and this application Septem-
ber 28, 1949, Serial No. 118,401

7 Claims. (Cl. 11-1)

1

This invention relates to improvements in book manufacture, and in the book product.

It is a primary object of the invention to provide novel and improved means and methods for facilitating and reducing the cost of the manufacture of books of the type commonly produced in great quantities for young children. While the invention is not limited to the production of books for this purpose, reference to these books will indicate a type of book with which the invention is particularly concerned.

It is a further and very important object of the invention to provide a novel and improved book construction resulting from the means and method of this invention and devised to provide unusual flexibility between the covers and the binding and at the same time unusual strength in the hinge.

It is a further object of the invention to provide novel and improved means for coloring the finished edges of books made in accordance with the invention.

Many other objects of the invention can be more particularly explained in connection with the following disclosure thereof.

This is a division of my pending patent application, Serial No. 739,165, filed April 3, 1947, upon book manufacture and the book product.

In the drawings:

Fig. 1 is a view diagrammatically illustrating in a series of perspective pictures the preferred sequence of operations involved in my improved book manufacturing method.

Fig. 2 is a view in plan of a blank comprising stock for a series of front and back covers and binding strips for use in the practice of my invention.

Fig. 3 is an enlarged fragmentary detail view in perspective showing a corner of the blank illustrated in Fig. 2 with its surface plies rolled back to illustrate the multiple ply construction.

Fig. 4 is a detail view in perspective showing strips of book covers and backs separated from the blank of Fig. 2.

Fig. 5 is a plan view diagrammatically illustrating the cutting of binding strips from the cover and back strips shown in Fig. 4, and the re-connection of such binding strips to the respective covers by the application of gummed tape thereto.

Fig. 6 is a detail view on an enlarged scale taken in section on the line 6-6 of Fig. 5.

Fig. 6a is a view similar to Fig. 6 showing a somewhat modified structure and procedure.

Fig. 7 is an enlarged view in perspective showing binding and cover strips in process of being assembled to contents strips or sections.

2

Fig. 8 is a view in perspective showing the binding strips stapled to the contents strips.

Fig. 9 is a diagrammatic plan view showing the application of tape to successive assemblies of the type shown in Fig. 8.

Fig. 10 is a further enlarged view in perspective showing a book cut from one of the bound and taped strips resulting from the procedure illustrated in Fig. 9.

Fig. 11 is a fragmentary detail view in end elevation of a portion of the book shown in Fig. 10.

Fig. 11a is a view in transverse section through a duplex book prior to the separation thereof into component books.

Fig. 12 is a plane view of an actual piece of apparatus for performing the process step diagrammatically illustrated in Fig. 5.

Fig. 13 is a view partially in side elevation and partially in longitudinal section of the apparatus shown in Fig. 12.

Fig. 14 is a plan view of the portion of the apparatus which carries out the process step diagrammatically illustrated in Fig. 9.

Fig. 15 is an enlarged fragmentary detail view in perspective of a portion of the apparatus shown in Fig. 14.

Fig. 16 is a view in longitudinal section on the line 16-16 of Fig. 14.

Fig. 17 is a view in perspective of apparatus optionally used for coloring the edges of the books otherwise completed as shown in Figs. 10 and 11.

Fig. 18 is a view in longitudinal section through a portion of the apparatus of Fig. 17.

Fig. 19 is a view in transverse section through a portion of the apparatus shown in Fig. 17.

The large sheet 20 shown in Fig. 2 provides cover and binding stock for twenty-four books, the precise number being unimportant. The sheet 20 comprises a cardboard core 21 (Fig. 3) to which is laminated facing plies 22, 23 upon which is printed any desired pictures or text which is to appear on the covers of the finished book. In the particular size of sheet illustrated, it is intended that the sheet be cut upon the lines indicated at 24, 25, 26, 27, 28, 29 and 30 in Fig. 2 into eight strips each containing six front or back covers. The areas 31 of the first strip 32, the third strip 33, the fifth strip 34 and the seventh strip 35 all represent back covers. The areas 36 of the second, fourth, sixth and eighth strips 37, 38, 39 and 40, respectively, all represent front covers. Each strip includes a portion not occupied by the front or back covers and this portion is used in binding as will hereinafter be explained.

A stack of the sheets 20, as shown at A in Fig.

3

1, is severed in any desired manner to provide piles of strips such as those indicated at 32 and 37 at B in Fig. 1. A pair of the individual strips is shown in Fig. 4. While the six book covers displayed by the strips 32 and 37 may be identical, I have found it convenient to make six different books simultaneously by the process herein disclosed.

The strips 32 and 37, spaced from each other approximately four times the thickness of one strip, as shown at the right in Fig. 5, are now fed in the direction indicated by the arrows in Fig. 5 and at C in Fig. 1 beneath the slitting knives 41, 42 which separate from the strips 32, 37 the narrow binding strips 43, 44, these being guided into edge contact by the wedge-shaped guides 45, 56. Immediately a pair of gummed or glued tapes 47, 48 are applied across the face of each binding strip and the adjacent margin of the cover strip from which it was cut. Thus tape 47 fastens the binding strip 43 in spaced relation to the cover strip 32, while the tape 48 fastens the binding strip 44 in spaced relation to the cover strip 37.

It will, of course, be understood that the operation of separating the binding strip from the cover strip and applying the tape to re-connect the parts in spaced relation could be carried on separately with regard to each of the cover strips or binding strips could be applied to each edge of a cover strip subsequently severed into two books after binding as disclosed below. However, it is a convenience to handle them in pairs as shown, the matter of spacing being taken care of automatically by the engagement of the margins of the binding strips with each other. As a result of this operation, we have a series of successive cover strips 32, 37 and binding strips 43, 44 taped thereto, the tape being continuous and the strips being spaced at their ends as shown in Fig. 5. The lateral spacing between the taped cover strips and associated binding strips is best shown in Fig. 6.

Meantime, the contents 50 (Fig. 7) of a number of books corresponding to the number of covers (one or more) on each of the strips 32, 37 will have been printed on page strips comprising pages or signatures in any desired number. The contents will be inserted between a back cover strip 32 and a front cover strip 37 as shown in Fig. 7 and at D in Fig. 1. Thereupon the staples 51, preferably at least two opposite each cover, will be applied by stapling head 510 (E in Fig. 1) to connect the binding strips 43, 44, of the respective cover strips 32, 37 to the intervening portions of the page strips, as shown in Fig. 8.

As an alternative to the procedure resulting in the structure of Fig. 6, I may, particularly when cloth tape is available, use, in lieu of the two separate tapes 47 and 48, a single wide tape 480, as shown in Fig. 6a. This tape 480 is somewhat more than equal to the combined width of tapes 47 and 48, since it also includes the width of the compacted contents 500. The mounting strips 43 and 44, instead of being forced together, edge to edge, are held apart for a distance equal to the thickness of the contents 500. The contents are preferably well compressed for the purpose and may be preliminarily stapled. With the gummed tape 480 applied to the two covers 32 and 37 and the two binding strips 43 and 44 and the spaces intervening between the several covers and mounting strips, the contents are then positioned on edge on the tape 480 in registry with the space between the mounting strips 43 and 44.

4

Thereupon one mounting strip and its associated cover is folded upon one side of the contents and the other mounting strip and associated cover are folded on the other side of the contents 500, after which binding proceeds as above described, by stapling the mounting strips 43 and 44 through the pre-stapled contents 500. The difference between the finished product of this process and the finished product of the process previously described will reside in the fact that the bound margins of the pages comprising the contents will be held in the bight of the wider tape 480, and the binding is stronger.

The assembled strip of books, completed to the extent shown in Fig. 8, is now bound along the binding strip edge with either cloth or paper tape formed into channel-shaped tape 52 which covers the staples 51 and completes the hinge and binding and also acts as an ornamental trim. This operation is performed as diagrammatically illustrated in Fig. 9 and at F in Fig. 1. The assembled strip books are fed beneath the roller 53. The tape is supplied at 54, guided about pulleys 55 and 56 and channels and applied to the hinge margins of successive book strips by the channelling former 57, which will be described in more detail later. The tape is coated with adhesive which is in a tacky condition as it reaches the channelling former. The spring-pressed guide 58 holds each successive book strip firmly into the tape channelling former 57 to ensure the firm application of the tape to the book strip in a position to overlies both of the binding strips 43, 44 and to lap across the intervening spaces on to the back and front covers 32 and 37, respectively.

The rotary grooving disk 59, and a similar disk operating below the book strip and not shown in Fig. 9, immediately press the moistened gummed tape into the gaps between the binding strips 43, 44 and the respective covers 32, 37, thereby not only drawing the tape 52 tightly into intimate contact with all of the surfaces embraced thereby, but also bonding it to the tapes 47, 48 as best shown in Fig. 10 and Fig. 11. The rolls 60, 61 press the tape to the cover and binding strip and deliver the book strips from the tape channelling and applying apparatus.

All that remains is to trim the several individual books and thereby separate them from the strips in which they have been bound and finish as desired. The trimming is illustrated diagrammatically at 64 in sketch G of Fig. 1. The resulting book is shown in Figs. 10 and 11. It not only has a neatly finished appearance but has a combination of exceptional strength with exceptional flexibility of the cover hinge. The hinge is made or formed at the gap between the binding portions 43 and 44 and the respective covers 32 and 37, such gap being at least twice the thickness of the cover stock and spanned by the tapes 47 and 48 originally applied to the inner faces of the covers across such gap and the finish tape 52 which spans the gap that has been forced by the forming disks 59 into the gap and bonded to the tapes 47 and 48 to provide for each cover a two-ply hinge, whereof both plies are at the level of the inner face of the cover. Fig. 11 shows in full and dotted lines various positions of the cover 37, in one of which it is open at almost 180° from its closed position.

While the individual books are now mechanically complete, it is desirable, for some purpose, to enhance their appearance by coloring all of their trimmed margins. This step of the process

5

is diagrammatically illustrated at H in Fig. 1 and may preferably be performed by apparatus shown in Figs. 17 and 19 and hereinafter described in detail.

Instead of separating the binding strips from the inner or adjacent margins of two separate cover strips as heretofore described, I may alternatively separate the binding strips from the outer margins of a duplex or double width cover strip, completing the taping and binding of a duplex book as shown in Fig. 11a and thereafter completing two separate and distinct books by simply severing the duplex book on the line $x-x$ of Fig. 11a. It will, of course, be understood that all of the individual operations performed in the completion of the duplex book shown in Fig. 11a, prior to the division thereof into separate component books, will, or may, correspond precisely to the operations already described, except that they will be performed on the outer margins of a double width cover strip instead of being performed on adjacent margins of two separate cover strips.

Having described my improved method for manufacturing books, I shall now describe more specifically the preferred apparatus used in the practice of certain portions thereof. Fig. 12 and Fig. 13 show the apparatus which has been diagrammatically illustrated in Fig. 5. There is a work table 65 to which the work is supplied from a feed table 66 and from which the partially completed work is delivered on to table 67. As the cover strips 32, 37 shown in Fig. 4 are delivered into the apparatus, they are separated by a low partition 68 which extends longitudinally of the feed table 66 and preferably corresponds to the combined width of the gaps later to be formed between the binding strips and the remaining cover strips. Lower feed rolls 69 barely project through the table and hence, in Fig. 12, appear to be smaller in diameter than the coacting upper feed roll 70. These feed rolls deliver the pair of strips to the rotary knives 41 and 42 already described. Immediately beyond these knives are the fixed wedges 45, 46 which push the severed binding strips 43 and 44 against each other at an accurately predetermined spacing from the remaining cover strips 32 and 37. Immediately beyond this point are the feed rolls 72, 73, the latter also serving to apply the twin tapes 47, 48. These tapes communicate from supply rolls 79, one of which is shown in Fig. 13. In passing between the guide rolls 80 and 81, the gummed under surface of the tape contacts the moistening roll 82 which operates in a trough 83. While reference has been made to gummed tape, it will, of course, be understood that the tape may comprise ordinary paper or cloth ribbons without any gumming, in which case liquid adhesive may be supplied from the trough 83. Since the only object is to produce a tacky surface for adhesion of the tape to the rest of the work, the apparatus will be referred to as a tackifying apparatus, regardless of whether it moistens gum already present on the tape or whether it applies liquid adhesive to a previously ungummed tape. Both types of device are well known to the art.

The tackified tape passes about the guide roll 81, over an adjustable arm that removes surplus glue and smoothes out tacky surface, then around guide roll 84, then guide roll 85 and guide roll 86, to the feed rolls 73. The guide roll 85 is adjustable upon the drier frame 87 so that, according to moisture conditions, the gummed surface of each tape may have exactly the desired degree

6

of tackiness before contacting the work. The spring-pressed drag 80 holds the supply roll 79 against overrun and causes the tape to be fed out under uniform tension.

After the tackified tape is applied to the work, the work passes between additional pressure rolls at 88 and 89 and a further set of pressure rolls 90, 91, 92 and 93. In approaching this further set of pressure rolls, the work passes beneath a floating block 94 having downwardly exposed convolutions or transverse teeth 95 which rest on the work and serve to smooth the tape as it passes therebeneath.

The work table 85 is provided throughout its length with guides 96, 97, 98, 99 and 100, 101, for accurately positioning the work in the course of its travel. Between the guides 100, 101, I preferably place an automatic cut-off or use a smooth, hard panel such as a plate glass surface and have an operator who inspects the work, make a transverse cut through the tapes 47, 48 which are otherwise continuous as shown in Fig. 5. Thus, by the time the work is delivered by rolls 103, 104 on to the discharge table 67, the individual work pieces shown in Fig. 7 can be separated from consecutive work pieces and are ready to be combined with the intervening contents 50, as shown in Fig. 7.

Driving connections to the various rolls may be effected in any desired manner and are sufficiently illustrated in Fig. 13 to require no detailed description.

Figs. 14 to 16 illustrate in more detail the apparatus diagrammatically shown in Fig. 9.

The table 105 is continuous from one end of the apparatus to the other, but is notched out to receive the several rollers hereinafter to be described, and also the tape channelling former. However, in order to provide a maximum of support for the work as it enters the former, I preferably employ a sheet metal plate 1050 which, having much less thickness than the table proper, can provide an extension of the table surface into the former as indicated in dotted lines in Figs. 14 and 15.

In Fig. 14, generally designated by reference character 106, is the tape supplying and tackifying apparatus. Since this may correspond with that already described in connection with Fig. 13, it needs no specific description here. The tackified tape passes over the guide rolls 55 and 56 as already described in connection with Fig. 9, and is engaged at its back by the channelling former 57 shown in detail in Fig. 15. Meantime assembled book strips of the type shown in Fig. 8 are being fed to the former by the feed rolls 107, 108. The free margins of the covers are engaged by a guide 58 which is subject to the lateral pressure of the springs 110, whereby the work pieces are pushed into the tape channelling former 57 to facilitate the firm application of the tape to successive work pieces. The tape channelling former has its tape receiving end almost flat and its delivery end provided with closely spaced flanges barely adapted to pass a bound book and channeled tape therebetween, said flanges gradually twisting from the originally flat positions thereof at the receiving end of the former to a substantially parallel position at the delivery end. The work pieces are further held flat by a floating weight 111 held by links 112 (Fig. 14) and preferably provided with rolls 113 which ride on the top cover of each successive work piece.

The function of the grooving disks 59 has

already been described. After these grooving disks operate on the work pieces, the work pieces are delivered out of the apparatus by the pressure and feed rolls 60 and 61.

If the books are to be painted or colored on their trimmed margins, the operator stacks them in bundles 115 after they have been trimmed as in sketch G of Fig. 1. The container 116 holds in its bottom a stain, dye, or ink or paint 117 in which operates the transfer roll 118. Peripherally engaged with the transfer roll 118 is the applicator roll 119, to the periphery of which is substantially tangent the table surface 120 which may comprise a cover for the color receptacle 116. The table 120 is preferably accurately adjustable as to height, as by means of the adjusting screws shown in Fig. 18. The table surface preferably curves slightly downwardly at 121 where the applicator roll 119 is exposed.

While a variety of surfaces may be used on the applicator roll, I prefer to surface rolls 118 with soft felt or spongy rubber and 119 with a pile fabric or soft, short hair brush 122. I find that on roll 119 the closely packed pile or brush does a much better job of painting the margins of the book without as much danger that the pigment or dye will creep by capillarity between the pages. The operator simply takes the bundle of books as shown at 115 and passes each of the three trimmed surfaces in turn over the table 120 in contact with the rotating roll 119. The roll 119 is operated by the motor 123 through speed reducer 124 and belt 125 at a moderate surface speed which is not critical and may approximate 100 feet per minute, the object being merely to present a fresh pile or brush surface to the work without operating roll 119 fast enough so that the dye or color will be thrown centrifugally therefrom. The pile of the fabric or brush colors the work evenly without undue pressure or speed.

I claim:

1. Apparatus for finishing the bound margin of a book which has pages, mounting strips bound to each other through the pages, and covers flexibly connected in spaced relation to the mounting strips by means of tapes applied to the inner faces of the mounting strips and covers, said apparatus comprising a conveyor for progressively moving books through the apparatus, and a tape feeder and tackifier for guiding tape along a path converging with a margin of books advanced by the conveyor, a channeled former in the path of tape delivered from said feeder and tackified whereby to form the tape in conformity with the channeled former, in position to be received about a book margin advancing longitudinally into said channeled tape, and means for exerting lateral pressure upon said book with reference to said former whereby to urge the book into intimate contact with the tape within the channeled former during the continued advance of the book and tape.

2. The device set forth in claim 1 in which said channeled former has its tape-receiving end almost flat and its delivery end provided with closely spaced flanges adapted barely to pass a bound book and channeled tape therebetween, said flanges gradually twisting from the originally flat positions thereof at the receiving end of said former to the substantially parallel position thereof at the delivery end of said former.

3. The combination set forth in claim 1 in further combination with a pair of pressing mem-

bers opposed to each other beyond said channeled former and registering with the spaces between the respective covers and their associated mounting strips whereby to force the channeled tape into such spaces.

4. A hinge-forming apparatus for a book binding machine for applying tape to a spaced cover and mounting strip across the intervening space, the cover and mounting strip being already connected below said space by a tape applied to their inner faces, said hinge-forming apparatus comprising tape feeding and tackifying means, an applicator for delivering the tacky tape of the outer faces of the mounting strip and cover across the intervening space, and a pressing member set at a level below the outer surfaces of the cover and mounting strip and in line with the aforesaid space, and means for producing relative movement between the pressing member and the work whereby the pressing member traverses the space between the cover and mounting strip forcing the tape into such space.

5. Apparatus for completing a book hinge between a mounting strip and a cover spaced therefrom and which are already joined by a flexible web at substantially the level of their inner faces, said apparatus comprising means for advancing such a book in a direction longitudinally of the space between its cover and mounting strip, means for feeding tacky tape on to the book in the course of its advance, said tape being of a width to span said space and adhere both to the mounting strip and the cover, and a pressing member in the path of book advance in line with said space and at a level below the exposed faces of the cover and mounting strip, whereby said pressing member will engage the newly applied tape to force it into said space in the course of book advance.

6. The apparatus set forth in claim 5 in which the level of the periphery of the pressing member such as to force the newly applied tape into such space to a depth such as to effect its adherence to the web originally connecting the cover and mounting strip, whereby to complete a two-ply hinge substantially at the level of the last mentioned web.

7. In apparatus for continuous application of tape binding to the marginal areas of books advanced along a conveyer, said apparatus comprising a tape feeder positioned to move tape in a path along the conveyer, a channeled former in the path of tape delivered from said feeder whereby to form the tape into channel shape, a conveyor to advance books successively along a path converging with the path of the channeled tape whereby said marginal areas are received in said channeled tape in the continued advance of the book and tape.

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