

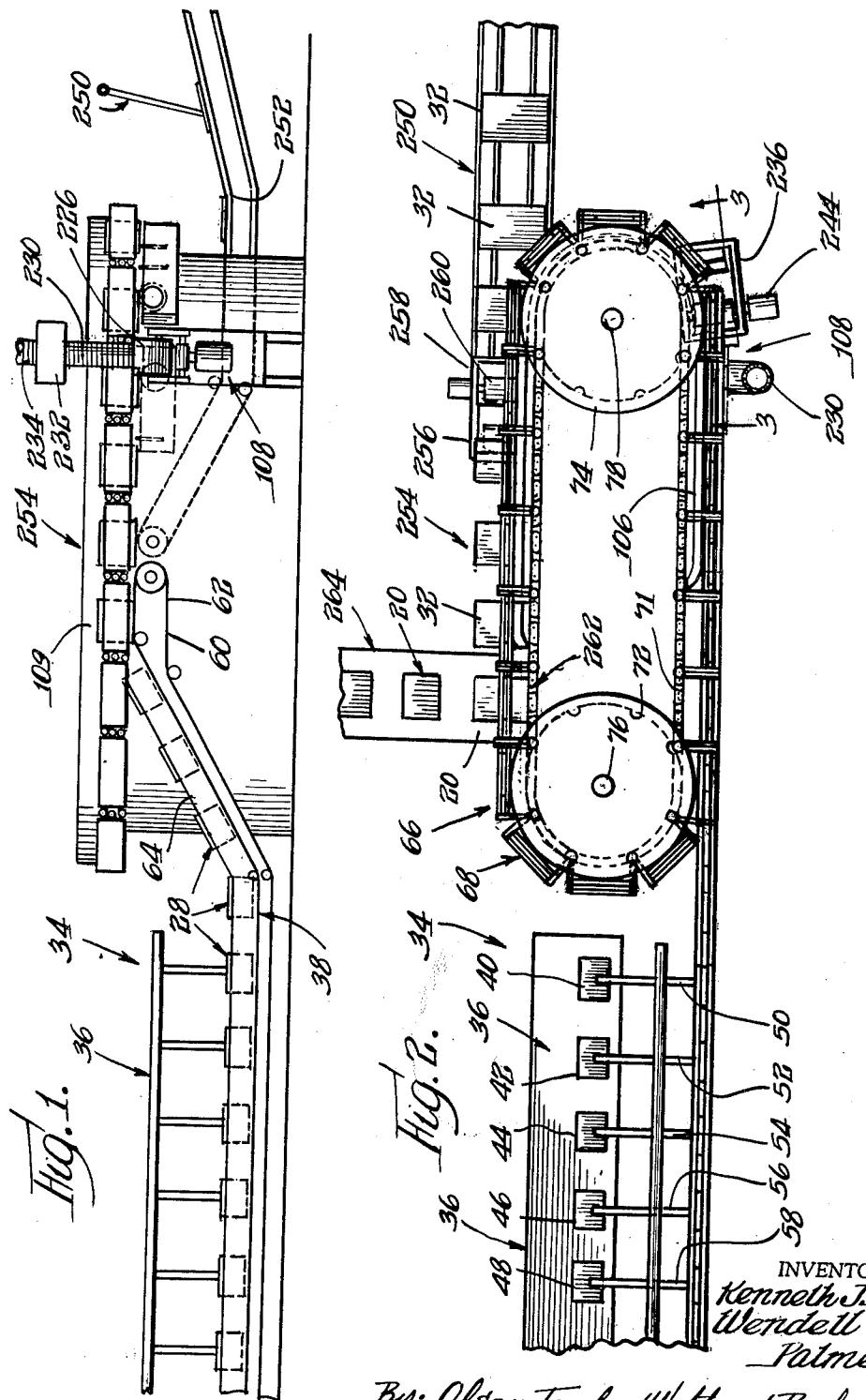
April 27, 1965

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MAGAZINE AND THE LIKE AND METHOD AND APPARATUS
FOR BINDING THE SAME

3,179,967

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4 Sheets-Sheet 1



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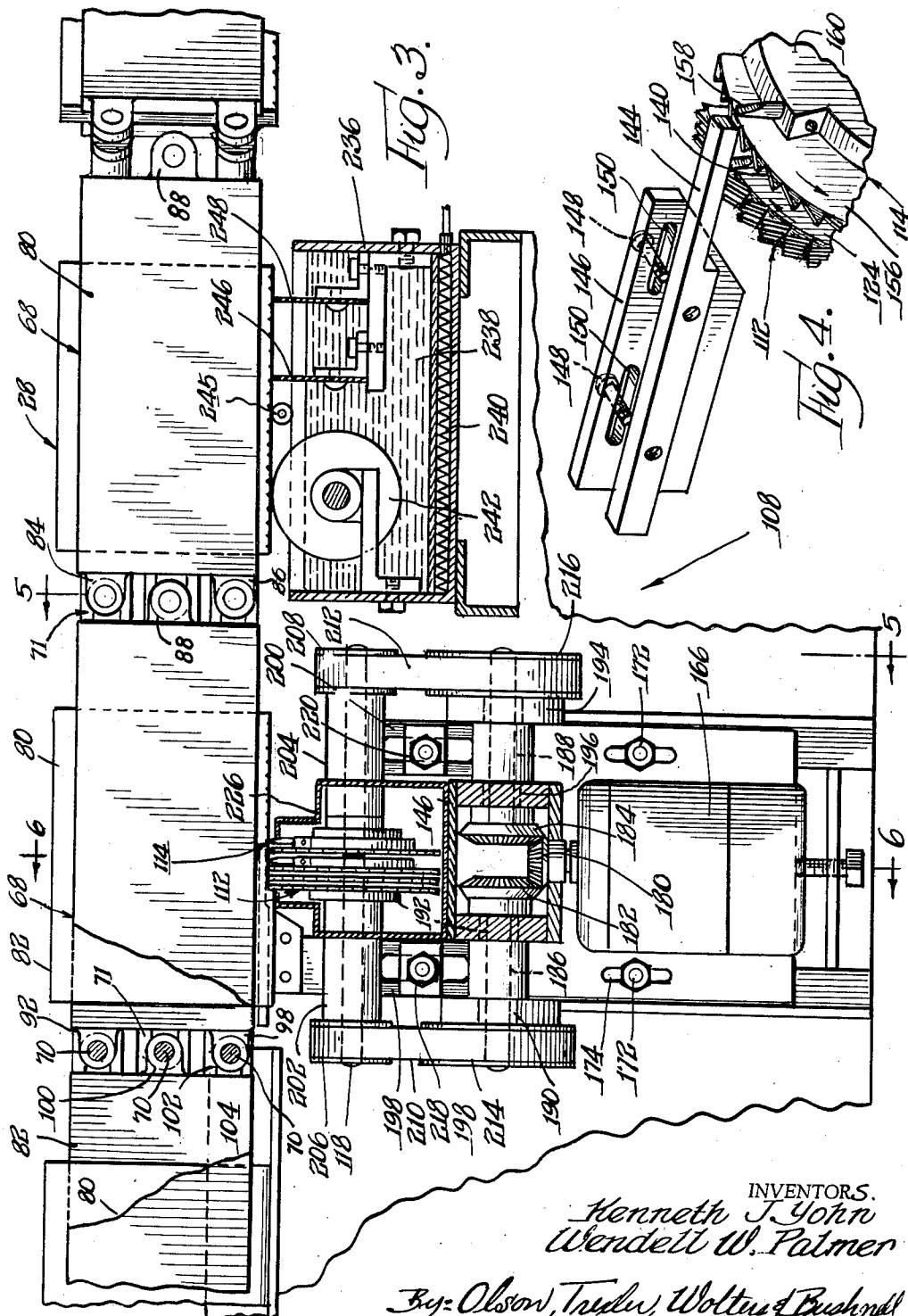
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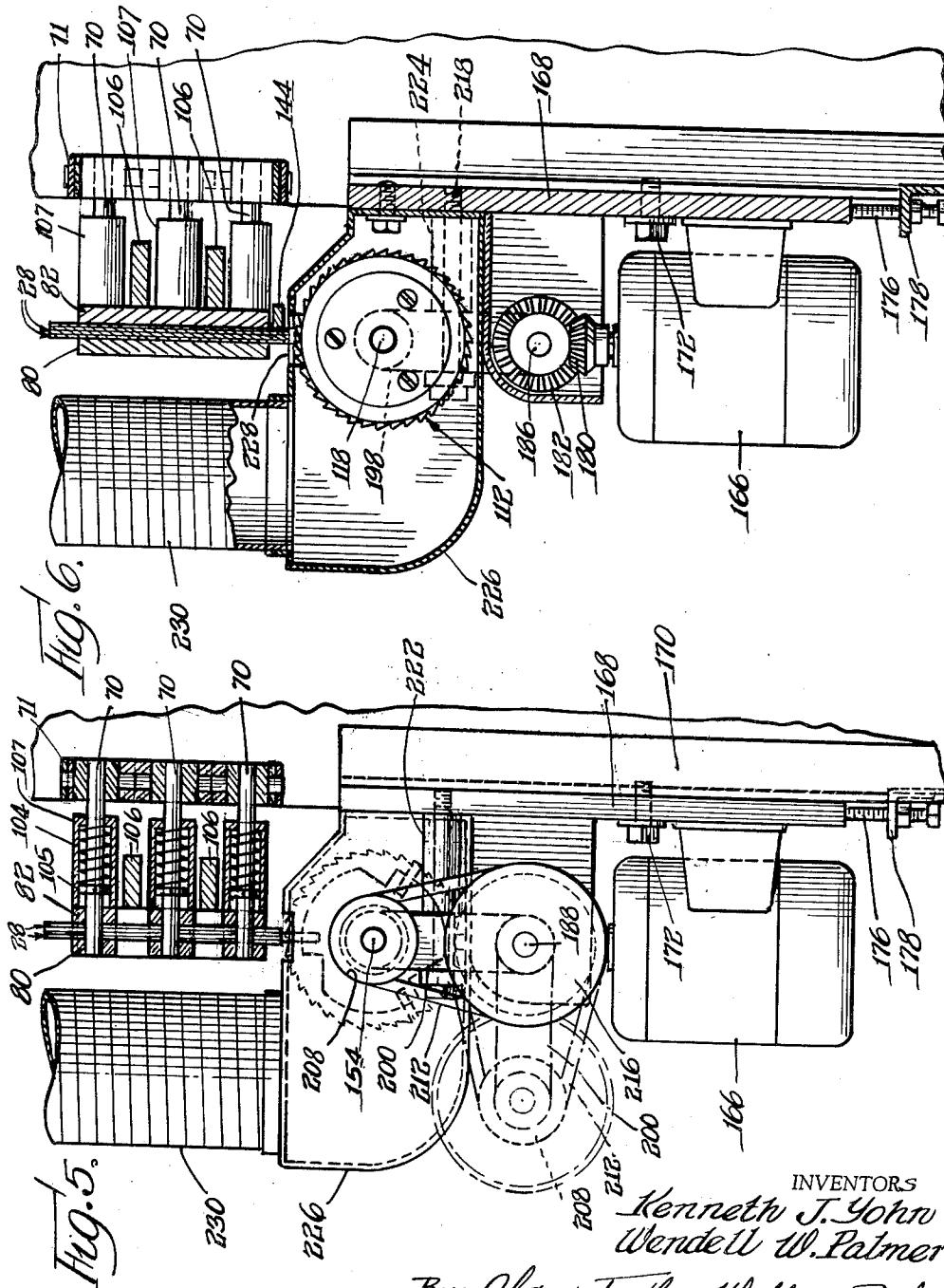
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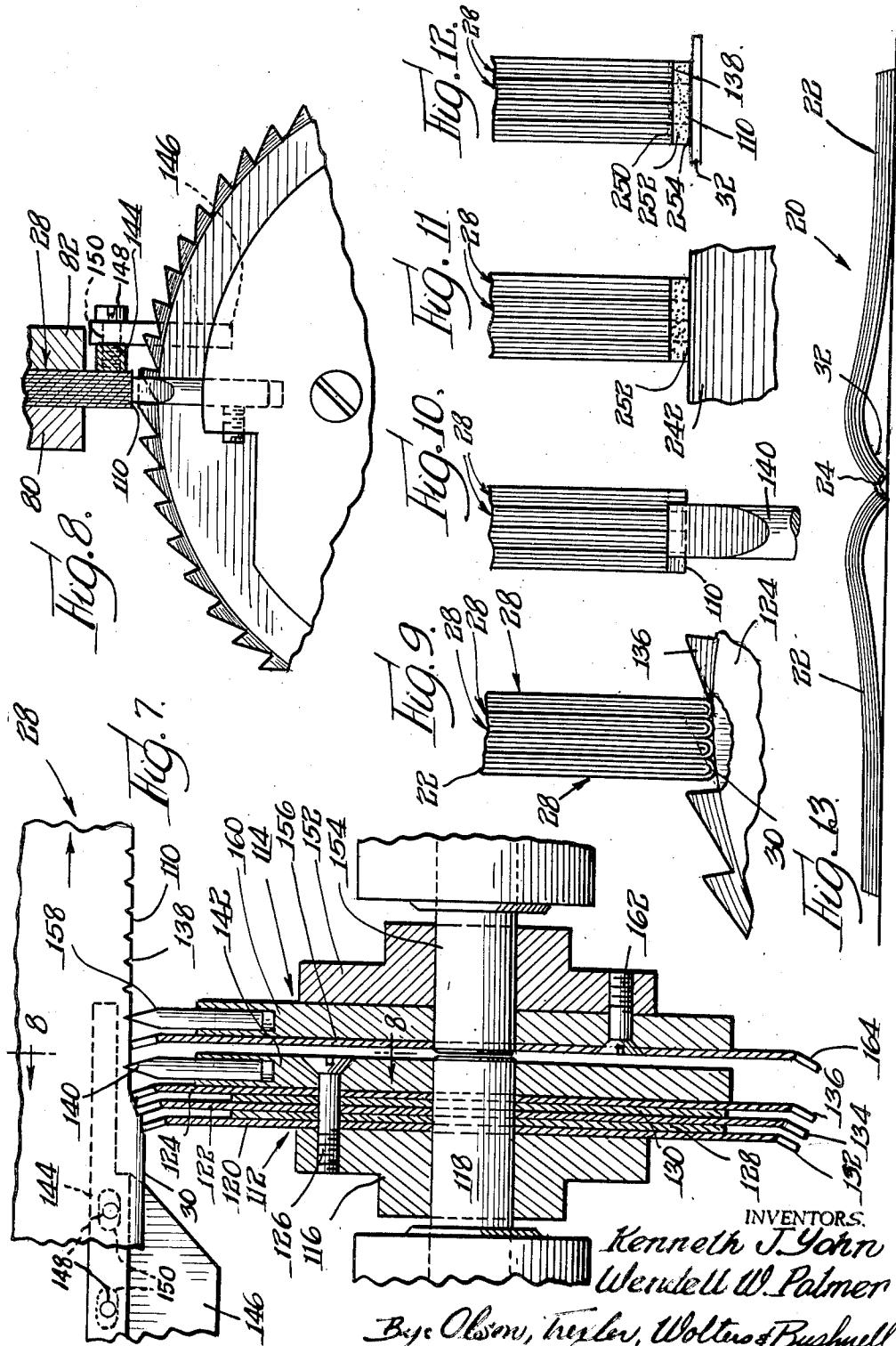
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MAGAZINE AND THE LIKE AND METHOD AND
APPARATUS FOR BINDING THE SAME
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The present invention relates to a novel method and apparatus for assembling and binding books, magazines and the like.

In the binding of magazines, certain books and the like, one procedure which has heretofore been widely adopted comprises the steps of gathering a plurality of pages together, then stapling or stitching the pages adjacent a margin thereof and finally applying a cover around the pages. While this procedure has been and still is widely used, one disadvantage of magazines and the like processed in this manner which has long been recognized is that the staples frequently prevent the magazine from being opened sufficiently to expose writing or other material printed on extreme marginal portions of the pages. Furthermore, the staples make it difficult and sometimes practically impossible to open a magazine sufficiently so that the pages will lie flat and so that the magazine will remain open to the desired page without constantly being held by the person using the magazine or in some other manner.

Proposals have heretofore been made for binding magazines and the like without the aid of staples or stitching, but such proposals have generally required the use of very expensive machinery and the replacement of existing equipment. Thus, a major portion of the magazines and the like are presently bound with the aid of staples or stitching.

An important object of the present invention is to provide a novel method and apparatus for binding a plurality of pages of an article such as a magazine, book or the like without the aid of staples, stitching or similar fastening means.

A further important object of the present invention is to provide a novel method and apparatus for binding magazines, books and similar articles without the aid of staples, stitching and the like but with the aid of much of the existing equipment. In other words, the present invention contemplates that existing binding machinery may be largely retained and modified for securing the pages of the magazine or the like without staples or similar fastening elements.

A still further important object of the present invention is to provide a relatively economical method and apparatus for binding pages of magazines, books and the like without the aid of staples, stitching or similar fastening means.

Another and more specific object of the present invention is to provide a novel article such as a magazine, book or the like and method and apparatus for binding the same, which article is formed so that pages thereof are solely adhesively connected together.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings wherein:

FIG. 1 is a simplified side elevational view showing a magazine or book binding apparatus incorporating features of the present invention;

FIG. 2 is a simplified plan view of the apparatus shown in FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken generally along line 3—3 in FIG. 2;

FIG. 4 is a fragmentary perspective view showing a portion of the apparatus in greater detail;

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FIG. 5 is a fragmentary sectional view taken generally along line 5—5 in FIG. 3;

FIG. 6 is a fragmentary sectional view taken along line 6—6 in FIG. 3;

FIG. 7 is a further enlarged fragmentary sectional view taken generally along line 7—7 in FIG. 6;

FIG. 8 is a fragmentary sectional view taken along line 8—8 in FIG. 7;

FIGS. 9, 10, 11 and 12 are fragmentary sectional views showing certain of the successive steps in the process of the present invention; and

FIG. 13 is a view showing an article such as a magazine formed in accordance with the present invention.

In FIG. 13 a magazine 20 incorporating features of the present invention is shown. The magazine comprises a plurality of pages 22 which are processed in the manner described in detail below and which are secured together solely by means of a quantity of glue or adhesive 24. As will be understood, the pages 22 are initially printed on large sheets which are repeatedly folded to the desired page size. As shown best in FIG. 9, a plurality of such sheets designated by the numerals 28 may be gathered together in the manner described below to provide the magazine, and the number of such sheets may, of course, be varied in accordance with the requirements of the particular magazine. As is further shown best in FIG. 9, each of the sheets 28 is folded so as to provide a plurality of the pages 22 which are initially joined to each other by folds 30 in the sheets, at least some of which are disposed along the edges of the pages which ultimately form the inner margins of the magazine. The article or magazine 20 also includes a cover 32 which is adhesively secured to the pages 22.

Referring now specifically to FIGS. 1 and 2, there is shown an apparatus 34 incorporating features of the present invention. Portions of this apparatus may be of known construction or may even be provided by existing equipment and therefore such portions are shown in simplified form herein and need not be described in detail. Thus, the apparatus 34 comprises gathering and feeding means 36 for assembling a plurality of the folded sheets 28 on a conveyor 38. The means 36 is provided with a plurality of stations 40, 42, 44, 46 and 48 for receiving supplies of the different folded sheets 28. It will be appreciated that the number of such stations may be varied in accordance with the requirements of the magazines, books and the like to be processed. The means 34 also includes feeding arms 50, 52, 54, 56 and 58 associated with each of the supply stations for delivering successive folded sheets 28 from the supply stations to the conveyor 38. As previously indicated, the feed arms and associated structures and mechanisms may be of known construction and therefore they are only schematically shown herein. It suffices to state that the mechanism is such that as a given portion of the movable conveyor means 38 passes the various stations, a folded sheet 28 is delivered to such portion of the conveyor from each station and thus, a plurality of the folded sheets 28 are gathered together in the abutting upstanding relationship shown in FIG. 1 and further shown in greater detail in other figures and particularly FIG. 9.

The conveyor 38 may also be of known construction and therefore need only be schematically shown. In general, the conveyor means 38 includes endless belt means 60 carrying a series of dogs or other suitable elements 62 adapted to engage and advance successive sets of the folded sheets 28, and suitable guide means 64 adapted to engage and retain the sets of sheets 28 as the sheets are advanced along a predetermined path of travel by the conveyor belt 60. Of course, suitable means, not shown, are provided for continuously driving the endless

belt 60 and for actuating the various elements of the feeding means 36 in timed relationship with the belt.

The apparatus 34 includes a second conveyor 66 adapted to receive successive sets of the sheets 28 from the conveyor means 38. The conveyor 66 is composed of a plurality of clamping units 68 connected by pins 70 to an endless chain structure 71 which encircles sprocket wheels 72 and 74 mounted for rotation by generally vertically disposed shafts 76 and 78. Suitable means, not shown, are provided for driving the conveyor 66 in timed relationship with the conveyor means 38 so that the successive units 68 are positioned for receiving successive sets of folded sheets 28 from the conveyor means 38. As will be understood, the means for driving these conveyors in timed relationship with each other and also in timed relationship with remaining portions of the apparatus may include a single prime mover and interconnected drive means having shafts, gearing, drive belts and the like, not shown, or separate prime movers may be provided along with adjustable variable speed drives also not shown.

Each of the chain units 68 comprises a pair of rigid plate members 80 and 82. The plate member 80 has a pair of ears 84-86 extending from one end thereof and another ear 88 at its opposite end and the plate member 82 has similar ears 92-98 and 100 projecting from opposite ends thereof which ears receive the pins or shafts 70. The ears of the plate members 80 are fixed on the shafts or pins 70 while the ears of the plate members 82 are slidably supported by the pins or shafts so that the plate members 82 may be moved toward and away from the plate members 80.

The plate members 80 and 82 of each of the units 68 are adapted to be spread apart so as to receive a set of the folded sheets 28 therebetween and the plate members are further adapted to be moved together so as to clamp the sets of folded sheets therebetween. Various suitable means may be provided for shifting the plate members 82 which are slideable on the pins or shafts 70 toward and away from the fixed plate members 80 or in other words to and from open and closed positions. For example, compression springs 104 (see FIG. 5) may be provided between abutments 105 on the shafts 70 and ends of sleeves 107 fixed to the ears of the plate members for opening the plate members 82. Fixed cam means 106 (FIG. 2) may be provided along a portion of the path of travel of the chain unit 68 for shifting the plate members 82 toward a page clamping or closed position.

As shown in FIG. 1, a portion of the conveyor means 38 extends beneath one course of the chain structure of the conveyor means 66 and then extends upwardly for directing successive sets of the folded pages 28 upwardly and between clamping plate members of successive chain units 68 at a loading station 109. Then the conveyor means 38 extends generally horizontally so as to position the successive sets of folded pages or sheets 28 with the lower or folded margins 30 thereof projecting below the lower margins of the plate members 80 and 82 of the units 68 for a purpose described fully below. After the sets of folded sheets 28 have been properly positioned between the plate members of successive chain unit 68 at the loading station 109, the plate members 82 of the successive units are moved or actuated by the cam 106 for tightly clamping the sheets in the proper position while they are continuously conveyed along the path of travel of the conveyor chain units 68.

In accordance with important features of the present invention, the apparatus 34 is provided with means 108 associated with the conveyor 66 at a work station downstream from the loading station 109 for adhesively securing the pages 22 of the folded sheets 28 together while the sheets are continuously conveyed along the path of the chain structure of the conveyor 66. The means 108 is shown in simplified form in FIGS. 1 and 2 and in greater detail in FIGS. 3-8. The means 108, in accordance

with the present invention, is adapted to remove the folded margins 30 from the pages of the folded sheets 28 and prepare the resulting raw edges 110 of the pages (see FIGS. 7, 8 and 10) for a subsequent application of an adhesive material in a manner which enables the adhesive material to connect the pages securely together.

In order to remove the folded margins 30 and prepare the resulting raw edges of the pages, the means 108 is provided with a pair of rotary or paper processing heads 112 and 114 shown best in FIGS. 3 and 6-8. The head 112 includes a hub member 116 fixed on a rotatably supported and driven shaft 118. Saw blades or circular cutters 120, 122 and 124 are secured to the hub member 116 by means of a plurality of screws or the like 126. The saw blades are preferably axially spaced from each other by spacers 128 and 130. The saw blades are of progressively increasing diameter in the direction of movement of the folded sheets 28 as shown by the arrow in FIG. 7 so as to accomplish progressive removal of the folded margins 30. As shown in FIG. 9, each of the folded sheets 28 may include several pages and a plurality of the folded margins 30 so that the saw blades must be constructed and arranged for removing a plurality of thicknesses of the paper. These thicknesses are preferably progressively removed by the blades of progressively increasing diameter so as to minimize any tendency of the saw blades unduly to roughen or tear the paper. Furthermore, it has been found that a smoother and more efficient cutting action can be obtained by forming teeth 132, 134 and 136 of the saw blades so that they are inclined at a relatively small acute angle from the plane of the blades in a direction opposite to the direction of movement of the folded sheets 28.

After the removal of the folded margins 30, ends of the fibers of the paper are exposed at the raw edges 110 and the paper is prepared to soak up adhesive material over the limited area of the raw edges. In order to increase the area of the raw edges and to provide for a more effective bond between the pages and the adhesive material, the head 112 is provided with means for forming a series of spaced small notches 138 of generally V-shaped configuration in the edges 110 of the pages. This means comprises a radially extending pointed notching tool 140 projecting radially outwardly of the largest blade member 124 and fixed to a disc 142 which is secured to the hub along with the blade members by the screws 126. It will be appreciated that a plurality of the tools 140 may be secured to and spaced around the disc 142. Thus, the number and spacing of the notches 138 may be varied by changing the number of the tools 140. Furthermore, the number and spacing of the notches may be controlled by varying the rotational speed of the head 112 with respect to the lineal speed or rate of advancement of the folded sheets 28 and this relationship, will of course, be predetermined and varied in accordance with the results desired.

As shown best in FIGS. 7 and 8, the folded sheets 28 project well below lower margins of the clamping plate 80 and 82 so as to provide a substantial amount of clearance between the cutting and notching head and the clamping plates. Thus, the lower marginal portions of the sheets are unsupported by the plates 80 and 82 so that the pressure and forces exerted by the saw blades and notching elements of the head structure 112 tend to deflect the lower marginal portions of the sheets from the vertical plane. In the embodiment shown, the processing head 112 is rotated in a clockwise direction as viewed in FIG. 8 so that there is a tendency for the lower exposed marginal portions of the sheets to be deflected toward the right. In order to resist this tendency of the exposed marginal portions of the sheets to bend toward the right, a supporting bar or finger 144 is disposed for engaging and backing up the exposed marginal portions of the sheets as shown best in FIGS. 7 and 8. The backup bar 144 is adjustably mounted to a fixed frame

member 146 by means of a plurality of screws 148 which extend through elongated slots 150 in the frame member.

The cutting or processing head 114 is axially aligned with and disposed in opposing relationship to the head 112 and includes a hub member 152 fixed on a rotatably supported and driven shaft 154. The head 114 further includes a saw blade 156 and one or more notching tools 158 carried by a disc 160, which saw blade and disc are secured to the hub member by a plurality of screws 162. The saw blade 156 and notching tool 158 are adapted to remove ragged or loose pieces of wrapped material from the raw edges 110 of the pages so as to smooth such edges. In order to accomplish this function and further to resist any tendency for the lower margins of the pages to bend toward the right as viewed in FIG. 8, the teeth 164 of the blade 156 face oppositely from the teeth of the blade members of the head 112 and the head 114 is driven or rotated oppositely from the direction of rotation of the head 112. Thus, the forces applied to the edges of the paper by the finishing head 114 tend to counteract the bending forces applied by the sawing and notching head 112.

In order to drive the heads 112 and 114, an electric motor or prime mover 166 is provided as shown best in FIGS. 3, 5 and 6, which motor is fixed to a vertically disposed slide plate 168. The plate member 168 is vertically adjustably secured to a portion 170 of the frame structure of the apparatus by means of screws 172 which extend through vertical slots 174 in the plate member. Suitable means such as a screw member 176 adjustably threaded through a fixed ear 178 mounted on the frame structure may be provided for vertically locating or adjusting the plate member 168.

A bevel gear 180 is fixed on the output shaft of the motor 166, which gear meshes with and drives in opposite directions additional bevel gears 182 and 184. The gears 182 and 184 are respectively fixed on and drive shafts 186 and 188 which are rotatably supported by suitable bearing means 190-192 and 194-196.

Arms 198 and 200 (see FIGS. 3, 5 and 6) are respectively pivotally connected to midportions of the shafts 186 and 188 adjacent first ends thereof and respectively carry bearing members 202 and 204 at opposite ends thereof. The bearing members 202 and 204 respectively rotatably support the shafts 118 and 154. Outer ends of the shafts 118 and 154 carry pulleys 206 and 208 respectively fixed thereon. The pulleys 206 and 208 are respectively driven by endless belts 210 and 212 which in turn are driven by pulleys 214 and 216 fixed on outer ends of the drive shafts 186 and 188.

The arms 198-200 are normally fixed in substantially vertical positions by means of bolts 218 and 220 which are connected to the slide plate 168 as shown in FIGS. 3 and 6. The position of the arms with respect to the slide plate may be adjusted by changing spacing blocks 222 and 224 through which the bolts 218 and 220 extend. Furthermore, the bolts may be loosened so that the cutting and finishing heads may be swung to the broken line position shown in FIG. 5 for adjustment or servicing purposes.

The removal of the folded margins 30 from the pages creates large quantities of paper dust, and the apparatus is provided with means for removing such dust. This means includes a housing 226 shown best in FIGS. 3, 5 and 6. The housing 226 is formed so that it completely encloses the cutting, notching and finishing heads 112 and 114. A slot 228 is provided in an upper side of the housing so as to expose the uppermost peripheral portions of the saw blades and notching means and so as to permit engagement thereof with the lower marginal portions of the paper sheets. The housing 226 is further formed so that a portion thereof projects laterally from the rotary heads 112 and 114, which portion is connected by means of an upwardly extending duct 230 with a suitable fan or blower 232 which is adapted to

draw air through the opening 228 in a manner so as to carry paper dust from the housing 226 through the duct 230 and the blower unit 232, which blower unit is shown in FIG. 1. It will be appreciated that the blower unit may be of various known constructions and need not be shown or described in detail. It suffices to state that the blower may be connected with a suitable discharge duct 234 so that the paper dust may be conveyed to any desired point of discharge.

As shown in FIGS. 1, 2 and 3, the means 108 for preparing and adhesively connecting the inner edges of the pages includes means for applying glue or adhesive material to the edges 110 of the sheets 28 after such edges have been prepared in the manner described above. More specifically, a glue pot 236 is located beneath the path of travel of the chain structure of the conveyor means 66 adjacent the previously described means for cutting and finishing the edges 110. The glue pot or container 236 is adapted to contain a supply of adhesive material 238 which may be maintained at an elevated temperature by means of a heater 240. The adhesive material 238 may be of various animal glue compositions or various synthetic adhesive compositions, but in any event, it is preferably provided or maintained in a condition of relatively low viscosity so as to promote penetration into the raw edges 110 of the sheets 28.

A partially submerged adhesive applying roller 242 is rotatably supported within the container 236 and may be driven by any suitable means such as a motor 244 shown in FIG. 2. The roller 242 is adapted to apply a substantial excess adhesive material to the raw edges 110 of the folded sheets 28 as the sheets pass over the roller as shown in FIG. 3 so as to promote penetration of the glue into the raw edges and also to promote complete filling of the notches 138 in the edges. A small roller 245 is suitably driven opposite to the direction of movement of the conveyor for removing a portion of the excess adhesive from the edges 110. Scraper blades 246 and 248 are adjustably mounted within the container 236 and project upwardly therefrom for engaging the edges 110 at a location downstream from the glue applying roller 242. The scraper blades 246 and 248 are adapted to apply pressure which tends to force the glue into the raw edges 110 and into the notches 138. In addition, the scraper blades remove excess adhesive material from the edges 110 of the paper.

Upon completion of the glue or adhesive applying steps described above, portions of the adhesive material will have soaked into the pages through the edges 110 as indicated at 250 in FIG. 12, additional portions of adhesive material fill the notches 138 as indicated at 252 in FIG. 12 and a further portion of the adhesive material provides a layer 254 traversing the edges 110 also as shown in FIG. 12. These various portions of the adhesive material combined together to provide the previously mentioned adhesive connection 24 between the margins of the pages 22.

After the pages have been adhesively joined in the manner described above, covers 32 are applied to the successive sets of pages and the magazines or books or the like are trimmed and finished in accordance with known procedures. Thus, as is schematically shown in FIGS. 1 and 2, covers 32 are successively delivered by a suitable feed mechanism 250 to conveyor means 252 which is driven by suitable means, not shown, in timed relationship with the conveyor means 66. As shown in FIG. 1, the conveyor means 252 has a portion which extends beneath the conveyor means 66 and then travels upwardly for applying the covers to the successive sets of pages at a work station 254. Prior to the work station 254 additional glue or adhesive applying means 256 may be located. The means 256 may be of any known construction including a container 258 for a supply of adhesive material and a driven roller 260. The roller is adapted to apply additional adhesive material to the previously

adhesively joined edges of successive sets of pages, which additional adhesive material serves to secure the covers to the successive sets of pages. In general, the adhesive material supplied by the means 256 may have a viscosity substantially greater than that of the previously described adhesive material, but the two materials must be compatible. It is further contemplated that in certain instances the adhesive applying means 256 may be omitted and the covers may be secured by the adhesive applied by the roller 242.

After the covers are applied at the work station 254, the magazines, books or the like 20 are ejected downwardly from the conveyor 66 at a discharge station 262 and deposited on another conveyor structure 264 also of known construction. The conveyor structure 264 advances the articles 20 to suitable apparatus, not shown, which trims the margins of the articles in a known manner.

A short resume of the method of preparing magazines, books and the like in accordance with features of the present invention is as follows. Pages to be bound together are first gathered in abutting relationship with certain edges thereof positioned in a predetermined manner whereupon the pages are continuously advanced along a predetermined path of travel. While the pages are advancing portions of said edges are progressively and evenly removed and a series of spaced notches is formed therein. The size and spacing of the notches may be varied in accordance with the particular requirements of the paper being processed. In general, paper which will absorb the adhesive material relatively easily requires fewer notches than paper which tends to absorb the adhesive material more slowly. After the edges of the pages have been cut and notched, an excess of relatively thin or low viscosity adhesive material is applied to the edges and pressed into the edges and into the notches whereupon any remaining excess adhesive material is removed. Then, if desired, a cover is applied to the adhesively bound pages and secured thereto either by means of the originally applied or with the aid of additionally applied adhesive, and if desired or necessary the resulting magazine, book or similar article is subsequently trimmed.

While the preferred embodiment of the present invention has been shown and described herein, it is obvious that many details may be changed without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. In an apparatus for binding a plurality of papers having means for conveying a plurality of pages with

5 predetermined margins thereof advancing along a path of travel, the combination comprising a pair of adjacent axially spaced, axially confronting and oppositely rotatable head means disposed adjacent said path of travel and rotatable in planes extending transversely of said path of travel, each of said head means including a rotary saw blade disposed in a plane traversing said path of travel and having a plurality of circumferentially spaced teeth generally radially extending therefrom and inclined oppositely with respect to the movement of pages along said path of travel at the point of engagement between the teeth and pages for transversely removing successive longitudinal portions of said margins to provide said pages with substantially continuous raw edges, and means for driving said head means in opposite directions.

10 2. In an apparatus as claimed in claim 1 wherein one said rotary head means includes a plurality of rotary saw blades with the teeth of each blade stepped to remove successive increments of said margins at increasing depths.

15 3. In an apparatus as claimed in claim 1, wherein the rotatable head means include rotary notching tool means disposed adjacent said saw blades and said path of travel and projecting radially beyond the saw blade teeth for forming notches in said edges.

20 4. In an apparatus as claimed in claim 3, wherein one of said rotatable head means in advance of said notching tool means includes a plurality of rotary saw blades with the teeth of each blade stepped to remove successive increments of said margins at increasing depths.

25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 1230 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