March 3, 1953 R. M. RAYNOLDS 2,630,046

MACHINE FOR ATTACHING INDEX TAB COVERS

Filed Oct. 6, 1948

5 Sheets-Sheet 1

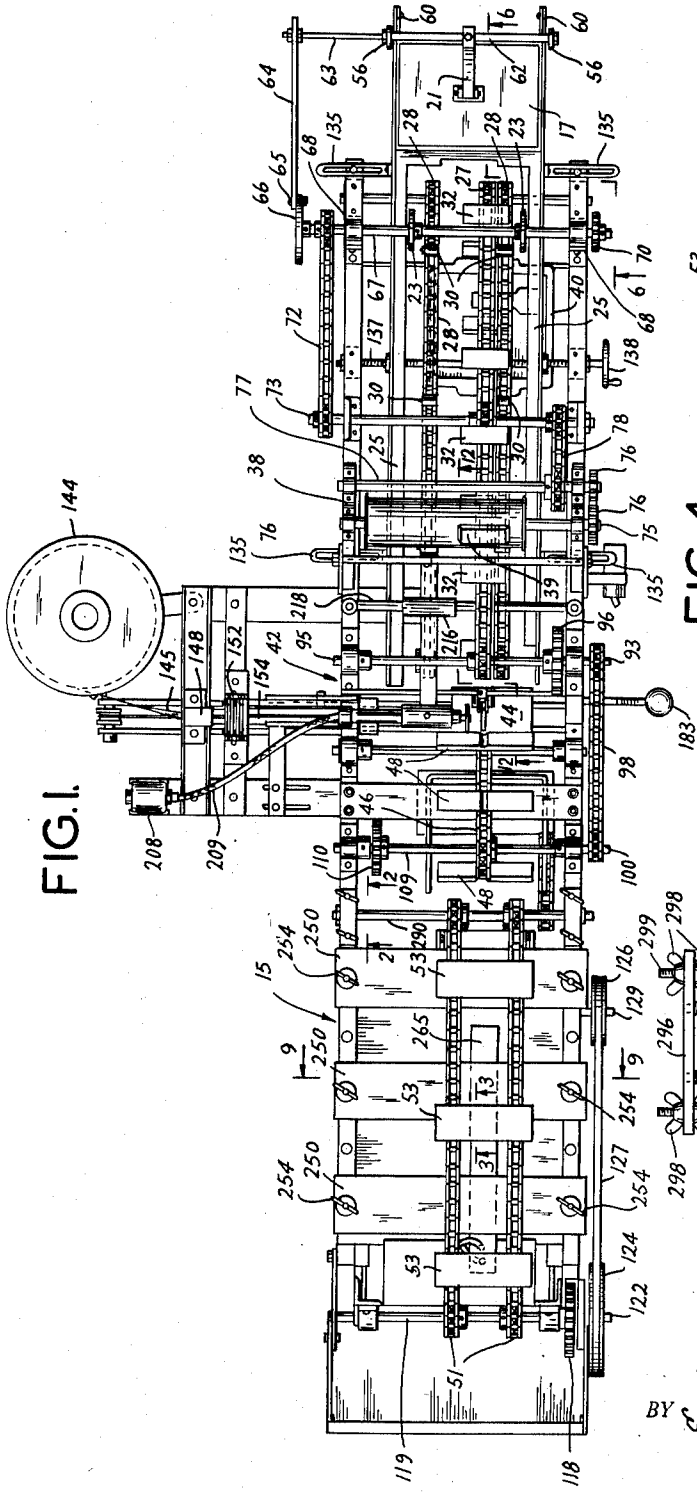


FIG. 1.

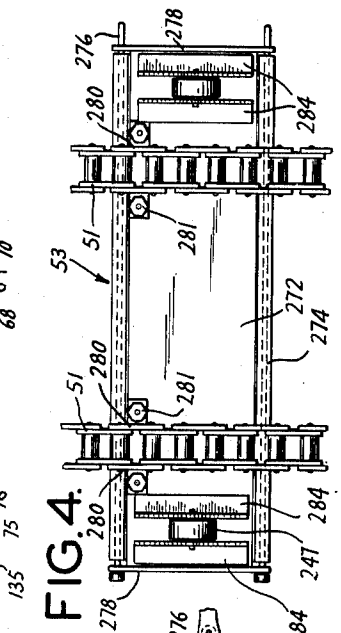


FIG. 4.

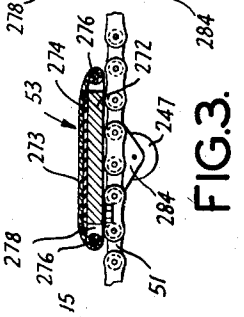


FIG. 3.

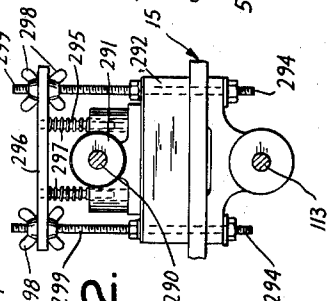


FIG. 2.

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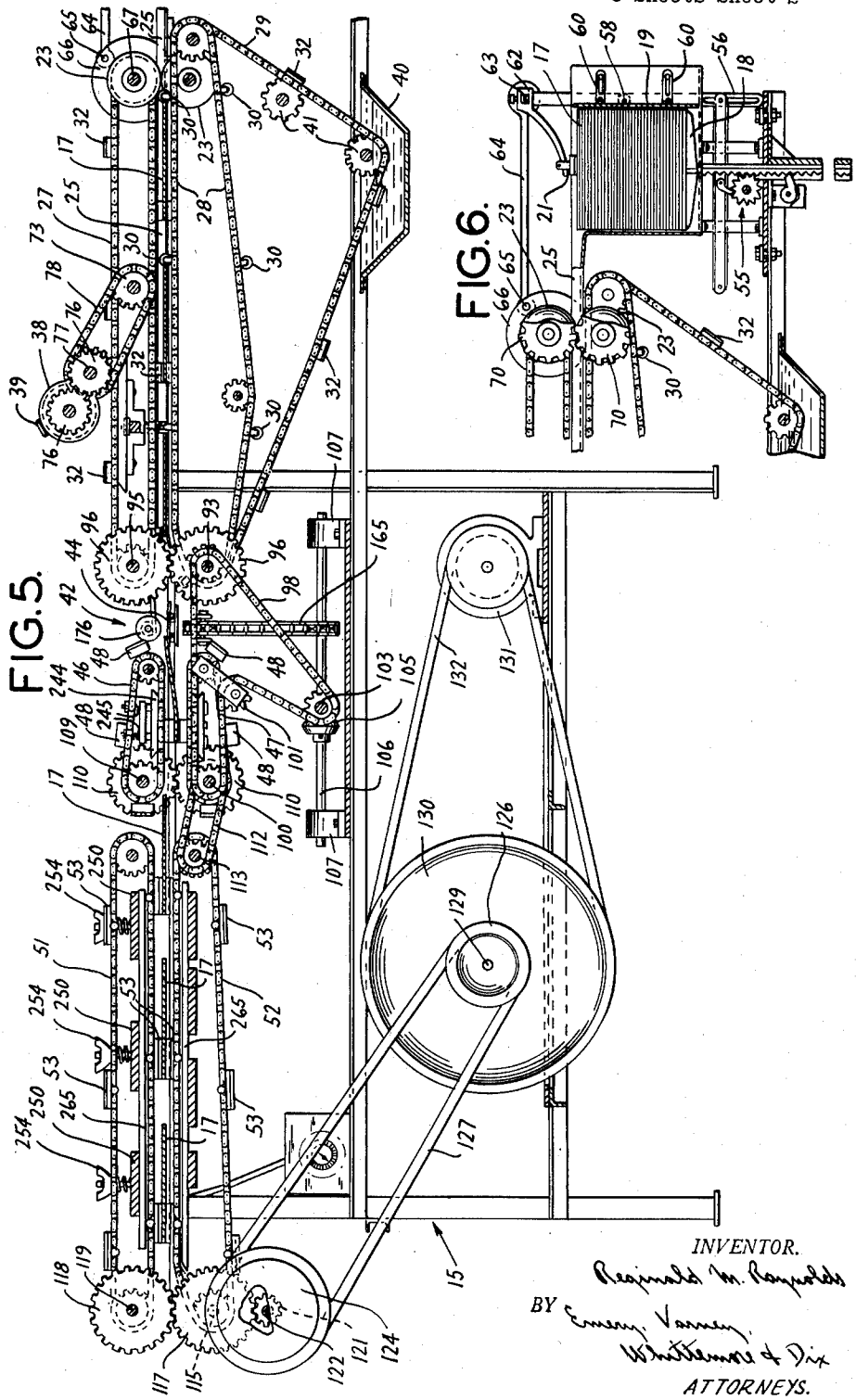


FIG. 5.

FIG. 6.

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MACHINE FOR ATTACHING INDEX TAB COVERS

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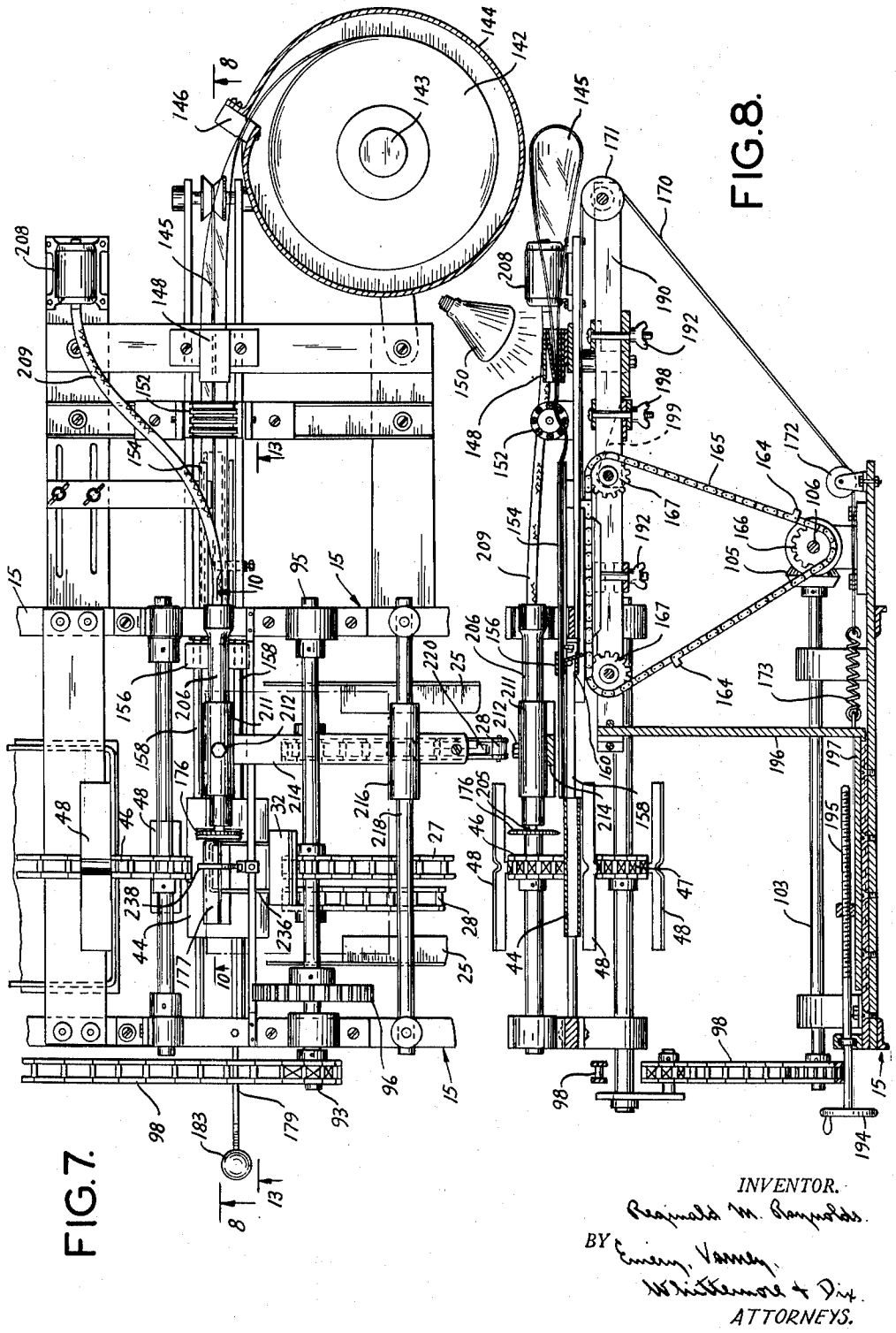


FIG.8.

FIG.7.

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MACHINE FOR ATTACHING INDEX TAB COVERS

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FIG. 9.

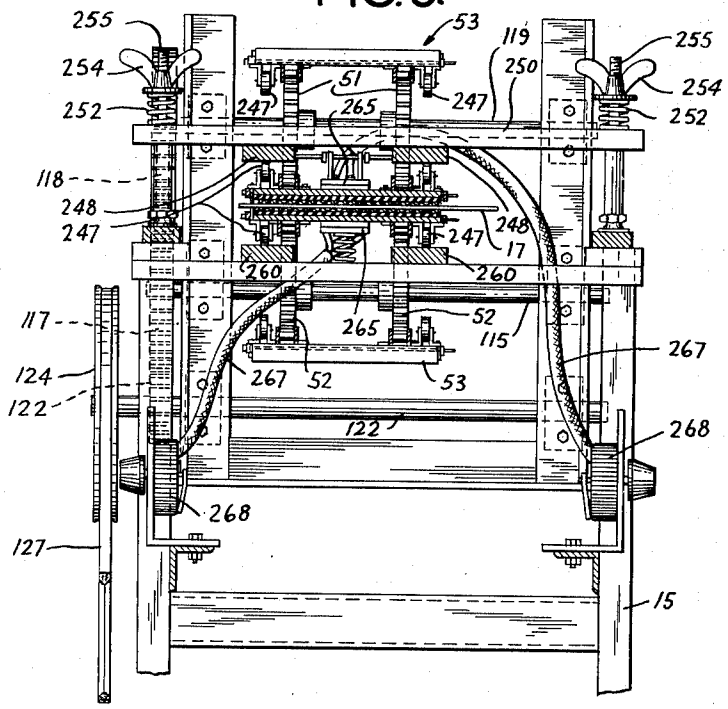
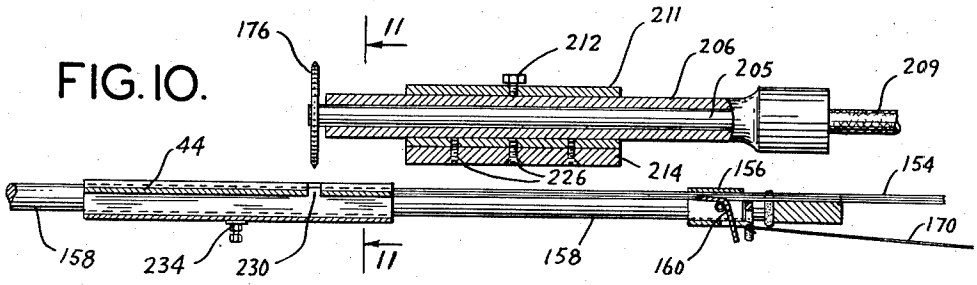


FIG. 10.



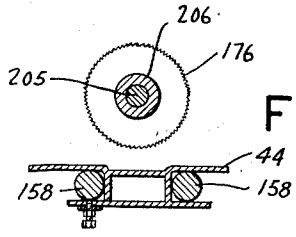


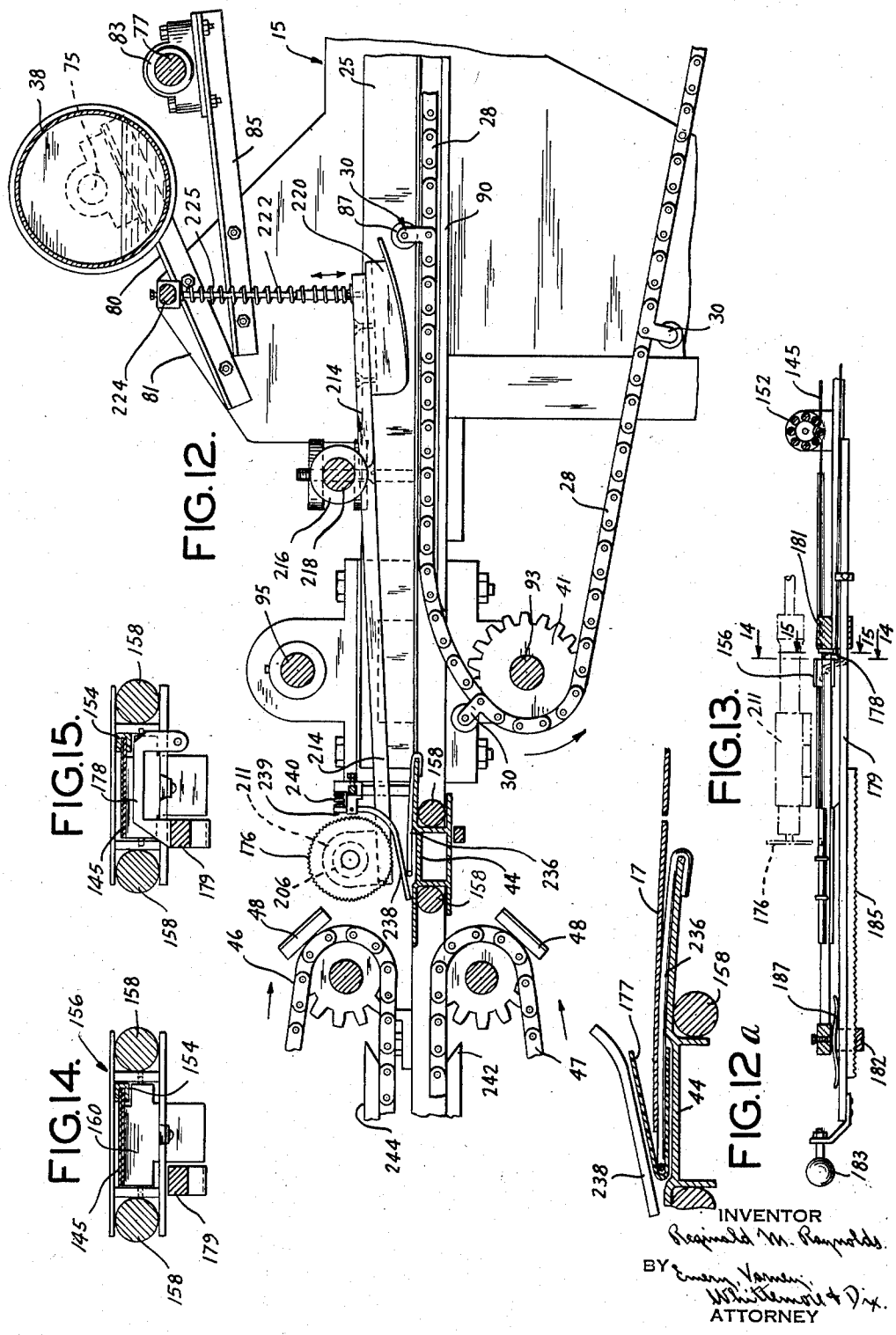
FIG. 11.

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MACHINE FOR ATTACHING INDEX TAB COVERS

Filed Oct. 6, 1948 5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,630,046

MACHINE FOR ATTACHING INDEX TAB COVERS

Reginald M. Raynolds, Summit, N. J.

Application October 6, 1948, Serial No. 53,095

20 Claims. (Cl. 93—1)

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Publications that are used repeatedly as reference works are often provided with special sheets separating different subject matter, and index tabs on the separation sheets are printed with legends identifying the sections. In order to keep the tabs from becoming dirty, torn, or otherwise damaged from extensive use, the tabs are commonly covered with a fold of Celluloid that usually extends down over a portion of the sheet to which the tab is connected to strengthen and brace the tab.

It is an object of this invention to provide improved apparatus for applying covers to index tabs of sheets that are to be used in books, particularly in loose leaf binders, or in filing systems, or other places where index sheets with tabs are used. The apparatus of this invention is automatic, and in its preferred embodiment, fully automatic, including the feeding of the sheets.

Features of the invention relate to the feeding of the covering material, preferably Celluloid, from a supply strip to an assembly station at which the folded strip is cut to length and held in position to receive a tab of a sheet feeding through the machine. Other features of the invention relate to adjustments for causing the cover to be applied to tabs located at different regions along the length of the sheet and for causing the apparatus to make longer or shorter covers for tabs of different size.

Other objects, features and advantages of the invention will appear or be pointed out as the description proceeds.

In the drawing forming a part hereof, in which like reference characters indicate corresponding parts in all the views,

Figure 1 is a top plan view of a tab attaching machine embodying this invention,

Figures 2 and 3 are enlarged sectional views on the lines 2—2 and 3—3 respectively, of Figure 1,

Figure 4 is a bottom plan view of the structure shown in Figure 3,

Figure 5 is a diagrammatic, vertical sectional view, on an enlarged scale, of a portion of the machine shown in Figure 1,

Figure 6 is a view similar to Figure 5, but illustrating the sheet feeding mechanism of the machine,

Figure 7 is an enlarged top plan view, partly in section, showing the tab forming apparatus and the attaching station of the machine shown in Figure 1,

Figure 8 is a sectional view on the line 8—8 of Figure 7,

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Figure 9 is an enlarged sectional view on the line 9—9 of Figure 1,

Figure 10 is an enlarged sectional view on the line 10—10 of Figure 7,

Figure 11 is a sectional view on the line 11—11 of Figure 10,

Figure 12 is an enlarged, fragmentary sectional view of a portion of the machine shown in Figure 1, the section being taken along the offset plane 12—12 of Figure 1,

Figure 12a is a detail view of a portion of Figure 12 on a greatly enlarged scale and with a Celluloid tab cover in position to be picked up by the next sheet,

Figure 13 is a sectional view taken on the line 13—13 of Figure 7,

Figures 14 and 15 are sectional views taken on the line 14—14 and 15—15 respectively, of Figure 13.

The invention can best be understood by considering first the general assembly of the machine as shown in Figures 1 and 5, and then considering the specific subcombinations with their operations and adjustments.

There is a main frame 15 which extends for substantially the full length of the machine. Sheets 17, to which tabs are to be attached, are stacked up on a platform 18 (Figure 6) in a housing 19. A feed finger 21 pushes the top sheet from the stack into the bite of feed rollers 23.

The feed rollers 23 advance each successive sheet 17 along guideways 25 and into the space between an upper endless chain 27 and lower endless chains 28 and 29. There are two chains 28, and feed dogs 30 on these chains 28 engage the rearward edge of each of the successive sheets 17 and advance the sheets along the guideways 25. The feed dogs are uniformly spaced along the chains 28 and their spacing is somewhat greater than the length of the sheets 17.

The forward edge of each sheet 17, to which the tab is to be connected, is soaked with a liquid during the travel of the sheet along the guideways 25. This liquid is preferably a solvent for the Celluloid, or other material of which the tab cover is made.

The liquid is applied to both the upper and lower surfaces of the edge portion of the sheet 17 by pads 32 which have absorbent faces soaked with the liquid. The pads 32 which contact with the top of the sheets 17 are carried on the endless chain 27 located above the sheets 17, and the pads 32 which contact with the undersides of the sheets 17 are carried by the endless chain 29.

Liquid is applied to the pads 32 of the upper chain 34 from a fountain roller 38 which has an

outlet with a porous cover 39. The fountain roller 38 is rotated at such a speed that its porous cover 39 makes one revolution while the chain 34 is traveling for a distance equal to the spacing of the pads 32 on the chain. As each pad 32 passes under the fountain roller 38, therefore, the porous cover 39 contacts with the face of the chain pad 32 and transfers liquid from the porous cover 39 to the chain pad 32. In this way the chain pads are kept wet for contact with the next succeeding sheet 17.

The pads 32 of the lower chain 29 are supplied with liquid from a reservoir 40 through which the pads 32 pass during their travel along the lower run of the chain 29, idler sprockets 41 being used to deflect the lower run of the chain 29 down into the reservoir 40. The pad chains 27 and 29 are operated in synchronism with the feed dog chain 23 and in such phase relation that the pads 32 of the upper and lower chains contact with the forward edge portions of each sheet 17 as the sheet is fed along the guideways 25.

If the sheets 17 are somewhat absorbent, as is usually the case, there is a time element to be considered in applying the liquid to the sheets, and for this reason the guideways 25 and the chains 27 and 29 are made long enough to maintain the liquid-soaked pads 32 in contact with the sheets 17 for the desired length of time for any selected speed at which the sheets are advanced through the machine.

At the ends of the guideways 25, each successive sheet 17 is fed to a tab cover attaching station indicated generally by the reference character 42. At this station, the forward edge of the sheet feeds across a plate 44 on which a folded tab cover is held with the open side of the fold facing in the direction from which the sheet 17 advances. The forward edge of the sheet enters the fold and pushes the tab cover from the plate 44 and into space between upper and lower chains 46 and 47 respectively. Clamping pads 48 on these chains 46 and 47 grip the tab cover and the forward portion of the sheet 17 which is located within the tab cover, and these clamping pads 48 advance the sheet and tab cover while maintaining a substantial pressure between the tab cover and sheet for a sufficient length of time to allow for the desired reaction between the liquid on the sheet and the material of the tab cover.

Although the final bonding of the tab cover to the sheet is done under heat and pressure, the clamping pads 48, which initially grip the tab cover and sheet, are not heated because it has been found by experience that a better bond is obtained if the liquid is allowed to react with the material of the tab cover for a limited time before the final bonding heat is applied. Premature application of the heat tends to dry out the liquid before it has reacted fully with the Celluloid of the tab cover. On machines using different kinds of adhesive or different materials for the tab covers, this preliminary time interval for reaction of the liquid with the tab cover material may be unnecessary.

As the chains 46 and 47 continue to run, the clamping pads 48, which have gripped the tab cover, advance it and the sheet 17. Other clamping pads 48 grip the sheet behind the tab cover clamping pads and advance the sheet after the pads that gripped the tab cover have released their grip on the tab. In order to obtain this result, the clamping pads on the chains 46 and 47

are spaced from one another by a distance less than the length of a sheet 17, but the spacing and movement of the clamping pads 48 is synchronized with the operation of the feed dogs 30 so that the covered tab portion of each successive sheet is gripped between a pair of the clamping pads 48.

The clamping pads 48 advance the successive sheets 17 into the space between the upper and lower endless chains 51 and 52. These chains carry heating plates 53 and are operated in synchronism with the clamping pad chains 46 and 47 in such a way that the tab and tab cover of each successive sheet 17 is gripped between two heating plates of the chains 51 and 52. The heating plates 53 maintain a heavy pressure against the tab cover and sheet to effect the final bonding of the tab cover to the sheet. The length of run of the heating plates and the chains 51 and 52 depends upon how long a period is required to effect the bond and upon how fast the sheets are fed through the machine. If high speed operation is desired, it will be evident that the runs of the chains 51 and 52 must be longer in order to maintain the heating elements in contact with the tab covers for the necessary period.

As the heating plates 53 move away from the sheets 17 at the ends of the adjacent runs of the chains 51 and 52, the sheets with the tab covers bonded to them drop out of the machine and on to a support or receptacle that is placed in position to receive them.

The apparatus for initially feeding successive sheets into the machine is best shown in Figures 1 and 6. The stack of sheets 17 on the platform 18 is raised gradually by pawl and ratchet feed mechanism 55 located under the platform 18 and of a construction well understood in the art. This mechanism is operated by levers 56 which are rocked about fulcrums 58 on the side of the housing 19. The back wall of the housing 19 is attached to the side walls of the housing by brackets 60 having slots which permit adjustment of the walls of the housing to accommodate sheets of different length.

The feed finger 21 is attached to a sleeve 62 which is of square, or other non-circular, cross-section and which extends between the upper ends of the levers 56 above the level of the housing 19. A non-circular shaft 63 fits into the sleeve 62 and slides in the sleeve to provide a telescoping connection to a connecting rod 64 which transmits movement to the sleeve 62 from a crank pin 65 to which the other end of the connecting rod 64 is pivotally fastened. The crank pin 65 is carried by a wheel 66. With each revolution of the wheel 66, the levers 56 are rocked and cause the feed finger 21 to push the top sheet from the stack.

The wheel 66 is attached to one end of a shaft 67 journaled in bearings 68 (Figure 1) on the main frame of the machine. The shaft 67 is the same shaft to which the upper feed rollers 23 are connected. There is a similar shaft under the shaft 67 for driving the lower feed rollers 23. The shafts for all of the feed rollers 23 are rotated in unison by spur gears 70 (Figures 1 and 6) that transmit rotation of the shaft 67 to the corresponding shaft below it. The shaft 67 is driven by a sprocket chain 72 (Figure 1) from a jack shaft 73.

The fountain roller 38 has an axle 75 on which there is a gear 76 in mesh with a correspond-

ing gear 76' on a countershaft 77 driven from the jack shaft 73 through a sprocket chain 78.

The supports for the bearings of the axle 75 and countershaft 77, which are located above the main frame of the machine, are best shown in Figure 12. The bearing for the axle 75 of the fountain roller 38 is supported on an angle bracket 80 attached to a side plate 81 which extends upward from the main frame 15 of the machine. A bearing 83 for the countershaft 77 is supported from an angle bracket 85 which is also connected with the extension plate 81 of the main frame 15.

Figure 12 shows also the construction of the feed dogs 30. Each of these feed dogs comprises an integral part of side plates on opposite sides of the sprocket chain 28. An axle extending across the feed dog 30 supports a roller 87 which operates the tab cover cut-off apparatus, in a way that will be more fully explained. The upper run of the chain 28 is supported by a plate 90 extending for most of the length of the upper run for the purpose of keeping the feed dogs 30 at a constant level.

The chain 28 is driven by a sprocket 92 attached to a shaft 93. The pad chain 29 (Figure 5) also passes across the plate 90 and around a driving sprocket on the shaft 93. The upper pad chain 27 is driven by a sprocket on a shaft 95. Motion is transmitted from the shaft 93 to the shaft 95 through spur gears 96.

The shaft 93 is driven by a chain 98 from a driving sprocket on a shaft 100. This sprocket chain 98 passes over an idler 101 and down around a sprocket on a shaft 103 which transmits motion through bevel gearing 105 to a longitudinally extending shaft 106 supported in bearings 107 at an intermediate level of the main frame 15.

The clamping pad chain 47 is driven by a sprocket on the shaft 100, and the upper clamping pad chain 46 is driven by a sprocket on an upper shaft 109. This shaft 109 is driven from the shaft 100 through spur gears 110. The shaft 100 is driven by a sprocket chain 112 from a shaft 113 which is rotated by power transmitted through the heating plate chain 52.

At the delivery end of the machine, the heating plate chain 52 passes around a driving sprocket on a shaft 115. This shaft 115 has a gear 117 connected to it at one end, and the gear 117 transmits motion through a similar gear 118 to a shaft 119 that rotates a driving sprocket for the upper heating plate chain 51. The gear 117 is driven by a pinion 121 on a shaft 122.

A pulley 124, which is connected to the shaft 122, is driven from a smaller pulley 126 through a belt 127. The pulley 126 is secured to a shaft 129 driven by a large pulley 130 from an electric motor 131 through a belt 132. The motor 131 is mounted on the lower portion of the main frame 15 and serves as the driving element for all parts of the machine except the saw that cuts the tab covers. By driving all of the mechanism from the same motor through the various motion transmitting connections already described, the machine obtains a perfect synchronizing of the operation of the various parts with respect to one another.

For operating on sheets of different sizes than the sheets 17, the chain 28 can be advanced or retarded with respect to the pad chain 29 so that the feed dogs 30 will follow the pads 32 by the correct distance for bringing the edge portions of the shorter sheets into the grip of the pads 32.

The machine is capable of applying tab covers of different length, as will be more fully explained in connection with the feeding and cutting of the tab cover material, but it is also necessary to be able to apply the tab covers at any selected distance from the top and bottom edges of a sheet. This adjustment for changing the location of the tab covers along the front edge of the sheet is obtained by shifting the guideways 25 toward and from one side of the machine. The tab cover at the attaching station 42 may be located in the same position transversely of the machine, and by moving the guideways 25 nearer to one side of the machine, a portion of the sheet nearer one edge will come into the tab cover.

The feeder mechanism must also be adjusted at the same time that the guideways 25 are adjusted so as to feed the sheets into the guideways. Such adjustment of the feeder mechanism, while the crank pin 65 and connecting rod 64 remain in the same position with respect to the frame of the machine, is possible because of the telescoping relation of the sleeve 62 and shaft 63.

The guideways 25 are supported from the frame of the machine by brackets 135 (Figure 1) which have slots for permitting the adjustment of the guideways 25 transversely of the machine frame. This transverse adjustment is effected by means of a lead screw 137 rotated by a hand wheel 138. Fastening means, such as screws, which extend through the slots of the brackets 135 to attach these brackets to the frame, must be loosened before the hand wheel 138 is operated. After the guideways 25 have been shifted to the desired positions, the screws for attaching the brackets 135 to the frame are again tightened to hold the guideways in place.

It is a feature of the machine that the guideways 25 can be moved into a position which will cause the tab covers to be mounted on the sheets with one edge of the tab cover substantially flush with one of the side edges of each sheet. The guideways 25 can be shifted transversely of the frame far enough to locate a tab cover at a region midway between the two side edges of the sheet.

No adjustment need be provided for locating the tab covers beyond this midportion because on any sheets where a location nearer the other side edge is desired, the sheets are merely turned upside-down in the feeder mechanism, and the guideways are adjusted to locate the tab covers at the desired spacing from the side edge which has been shifted to the other side of the sheet by turning the sheet upside-down. This feature is advantageous in that it limits the amount of transverse adjustment that has to be provided for. The supporting plate 44 on which the tab covers rest while waiting to be picked up by the sheets is located nearer one side of the machine because of this adjustment feature which provides for placing of the tab covers along only one-half of the width of the sheets.

The Celluloid from which the tab covers are made is wound in a reel 142 (Figure 7) on a spindle 143 and is enclosed within a fire-proof housing 144. The Celluloid is withdrawn from the housing 144 as a strip 145 which passes out of the housing through wipers 146 that remove any dirt from the Celluloid, and the strip 145 folds as it passes from the housing 144 to a folding die 148 (Figure 8). The Celluloid is softened by radial heat from an infra-red lamp 150, or any other suitable source of heat. The folded

Celluloid passes through another die 152 which presses the fold together and eliminates any curling of the material beyond the die 152. The fold of the Celluloid enters a long guide 154 which extends all the way to the plate 44.

At a region substantially midway between the ends of the guide 154, the folded Celluloid passes through a feed device 156. This feed device slides along guide bars 158 and contains a gripping pawl 160 which grips the Celluloid during the forward movement of the feed device 156. The gripping pawl 160 releases the Celluloid strip during the return movement of the feed device.

The construction of the feed device 156 and its position on the guide rods 158 is best shown in Figures 14 and 15. From these views it is apparent that the gripping pawl 160 grips the portion of the Celluloid strip that extends beyond the guide 154, and the fold of the strip remains in the guide 154 during the feeding of the strip.

Referring again to Figure 8, the actuating mechanism for advancing the feed device 156 comprises dogs 164 on a sprocket chain 165 which passes over a lower driving sprocket 166 and around two upper idler sprockets 167. When one of the dogs 164 strikes against the downwardly extending end of the gripping pawl 160, this pawl is rocked about its pivotal support and the upper end of the pawl clamps the Celluloid strip against the top of the feed device 156 so that the strip and feed device move as a unit.

The feed dog 164 pushes the feed device 156 toward the attaching station until the feed dog travels around the left hand sprocket 167. This movement of the feed dog around the sprocket causes the feed dog to move downward until it passes under the gripping pawl 160. The feed device 156 is then pulled back to its starting position by a steel band 170 which passes around pulleys 171 and 172 to a spring 173.

With each forward stroke of the feed device 156 a length of the folded Celluloid strip 145 is advanced under a cut-off saw 176 and across the plate 44. At the end of the feed stroke, the cut-off saw 176 is moved downward, by apparatus which will be described, and the portion of the Celluloid strip beyond the cut-off saw is severed and comprises a tab cover 177 for connection with the next sheet that crosses the attaching station.

The return stroke of the feed device 156 is limited by a stop 178 (Figure 13) attached to a slide 179 which extends through bearings 181 and 182. The slide 179 is connected at its forward end to a knob 183 at the front of the machine. There is a rack 185 on the underside of a portion of the slide 179, and the teeth of this rack mesh with fixed teeth in the bearing 182 for preventing endwise movement of the slide 179. A leaf spring 187 holds the rack 185 down against the teeth of the bearing 182.

When the slide 179 is to be moved in the direction of its length to shift the stop 178, the knob 183 is raised to lift the rack 185 out of mesh with the teeth in the bearing 182, and the slide 179 is then moved in or out as desired. The purpose of this slide 179 and knob 183 is to stop the operation of the feed device temporarily while the other parts of the machine continue to operate. The feeding of the strip is stopped whenever the abutment or stop 178 is pulled forward far enough to keep the feed device 156 out of the path of the feed dogs 164 (Figure 8) that produce the automatic operation of the strip feed device.

When the machine is to be adjusted for feeding the forward end of the strip 145 further, or not as far, beyond the saw 176, a frame 190, which carries the sprockets 167 and the pulley 171, is moved toward or from the attaching station. This movement is effected by first loosening clamping nuts 192 which hold the frame 190 in place on the main frame of the machine, and then turning a hand wheel 194 and lead screw 195 to shift a base 196 by which the frame 190 is carried. This base 196 moves in a dovetail slide 197 attached to a fixed portion of the main frame 15.

The driving sprocket 166 does not move when the frame 190 is adjusted, but provision is made for maintaining the correct tension on the chain 165 by shifting the right-hand sprocket 167 toward the right or left along the frame 190 as may be necessary. This adjustment is made by releasing a clamping bolt 198 which holds a bracket 199 on which the axle of the right-hand sprocket 167 is supported. The bracket 199 slides along the frame 190.

The sprocket 166 which drives the chain 165 is secured to the shaft 106. Since the shaft 106 is driven from the same motor that operates the other parts of the sheet feeding mechanism, the operation of the Celluloid strip feed by the chain 165 is maintained in synchronism with the operation of the sheet feed.

The saw 176, which cuts tab covers of the desired length from the Celluloid strip, is connected with one end of a shaft 205 that turns in a bearing sleeve 206. This shaft 205 is driven from a motor 208 through a flexible drive shaft 209.

The bearing sleeve 206 is clamped in a housing 211 by a set screw 212; and the housing 211 is connected with one end of a frame 214. This frame 214 extends toward one end of the machine and is rigidly secured to a bearing 216 (Figure 12) on a shaft 218 that extends across the width of the machine between the opposite sides of the main frame 15.

Beyond the shaft 218 there is a foot 220 attached to the underside of the bracket 214 in the path of the rollers 87 that are carried by the chain 28. As each of the rollers 87 passes under the foot 220, the foot 220 is lifted, and the frame 214 is rocked on its bearing 216 about the shaft 218. This rocking movement of the frame 214 moves the saw 176 down and causes the saw to cut the folded Celluloid and sever a new tab cover from the strip.

As soon as the roller 87 has passed beyond the foot 220, the frame 214 is returned to its normal position by a spring 222 that is compressed between the top of the frame 214 and a support 224 extending from the side plate 81. There is a telescoping rod 225 with its opposite ends connected to the frame 214 and support 224. This telescoping rod extends through the spring 222 and holds the spring in place.

Provision is made for adjusting the saw 176 transversely of the machine to obtain some additional flexibility in the adjustment of the machine, but is not essential because of the adjustable guideways by which the strips can be fed to the tab cover attaching station along paths which can be shifted transversely of the frame.

In the construction shown, the transverse adjustment of the saw 176 is obtained by releasing the set screw 212 (Figure 16) and shifting the bearing sleeve 206 lengthwise in the housing 211. The housing 211 is connected with the bracket 214 by screws 226. There is a slot 230 in the plate 44 immediately below the saw 176, and the

saw moves downward into this slot 230 when cutting a tab cover from the Celluloid strip.

The plate 44 has downwardly extending portions that fit between the rods 158 and the plate 44 can slide along these rods. A set screw 234 is used to hold the plate 44 in any adjusted position along the rods 158. Whenever the position of the saw 176 is shifted transversely, the plate 44 must be similarly moved to keep the slot 230 under the saw.

A paper support comprising a wire loop 236 (Figure 12a) is attached to the plate 44 and extends across a portion of the plate 44 between the flaps of the folded Celluloid strip so that as each sheet moves into position to pick up a tab cover at the attaching station, the support or loop 236 holds the liquid coated edge portion of the sheet out of contact with the lower flap of the tab cover until the sheet is inserted all the way into the tab cover. This prevents possible sticking of the sheet to the bottom flap of the tab cover before the sheet has entered fully into the tab cover.

A brake 238 is supported on a pivot 239 and the brake is held down against the fold of the tab cover by a spring 240. Figure 12 shows the position of a tab cover 177 under the brake 238 as a sheet 17 enters the tab cover. The brake prevents the tab cover 177 from moving beyond the plate 44 before the sheet has entered fully into the tab cover.

When the end of the sheet contacts with the inside of the tab cover fold, further movement of the sheet forces the tab cover under the brake 238 and into the space between the clamping pads 48 (Figure 12) which are timed with respect to the paper feed so that upper and lower clamping pads 48 move into position to grip the tab cover and the sheet as they come from under the brake 238. The lower pads 48 are supported by a plate 242 under the upper run of the chain 47, and the upper pads 48 are held down firmly to maintain a clamping pressure on a tab cover and sheet by a pressure plate 244 which is urged against the lower run of the chain 46 by springs 245 (Figure 5).

The heating plates 53 to which the tab covers and sheets pass after leaving the clamping pads 48, are shown in Figure 9. Each of the upper heating plates 53 is connected with two parallel chains 51 and has rollers 247 which travel along a frame 248 while the heating plate 53 is traveling along the lower runs of the chains 51. These frames 248 are held down firmly by cross ties 250 adjustably loaded by compression springs 252. The tension on the springs 252 can be adjusted by screwing wing nuts 254 up-or-down.

The lower heating plates 53 are connected with parallel chains 52 and these lower heating plates are held against the underside of a sheet 17 by fixed supporting frames 260, which are a part of the main frame of the machine. There are rollers 247 on the lower heating plates 53 in position to roll against the fixed frame 260.

The heating plates 53 are heated by heating elements 265 located along a part of the path of movement of both the upper and lower heating plates 53. The heating elements 265 contain electric resistance units that are supplied with power through cables 267 from adjustable rheostats 268. Heat from the heating elements travels to the heating plates 53 by conduction during the time that the heating plates 53 are in contact with the heating elements.

Figure 1 shows the extent of the heating elements 265. These elements are long enough to maintain contact with the heating plates 53 during most of the time that the heating plates are in contact with each tab and sheet; and it is a feature of the invention that the heating plates 53 are in contact with the heating elements 265 during the latter part of the movement of the heating plates while in contact with the tab covers so as to maintain the temperature of the heating plates after some of their heat has been transferred to the tab covers and sheets.

The detailed construction of one of the heating plates 53 is shown in Figures 3 and 4. The heating plate comprises a metal body 272 covered by a layer of rubber padding 273, and an outer cloth cover 274 which holds the rubber padding in place, and which is itself held in place by pins 276 extending through hems at opposite ends of the cover 274. These pins 276 pass through flanges 278 at opposite ends of the heating plate body 272.

There are side plates 280 on the chains 51 with angular lugs extending across the metal body 272 and connected to the metal body by screws 281. In this way the metal body 272 is firmly connected with the chains 51. The rollers 247 which maintain the heating plate under pressure when in use, are connected to the metal body 272 by angular brackets 284 which are brazed or otherwise connected to the surface of the metal body 272. There is a broad expanse of the metal body 272, between the chains 51, unobstructed so as to leave a substantial area for contact with the heating element 265 on which the metal body rubs to raise its temperature during a part of its travel.

Since it is desirable to have the heating plates 53 exert a heavy pressure against the tab covers and sheets from the time that each tab cover and sheet first comes within the grip of a pair of upper and lower heating plates 53, resilient pressure means are provided for holding down the sprockets at the forward ends of the heating plate chains 51. The sprockets of these chains are carried on a shaft 290 (Figures 1 and 2). Each end of this shaft 290 rotates in a bearing block 291 mounted on a block 292 which rests upon the main frame 15. This block 292 is rigidly connected with the frame 15 by bolts 294, and the block can be considered as a portion of the main frame 15.

The bearing block 291 is held against lateral displacement by studs 295 extending downward from a frame 296 and into bores in the bearing block 291. There are springs 297 compressed between the bearing block 291 and the overlying frame 296. These springs 297 urge the bearing block 291 down against the supporting block 292.

The shaft 290 for the sprockets of the chains 51 is so located with respect to the shaft 113 on which the sprockets of the lower chains are carried, that when the heating plates 53 of the upper and lower chains grip a tab cover and sheet between them, the shaft 290 lifts the bearing block 291 slightly away from the supporting block 292. The heating plates are thus put under pressure by the springs 297, and this pressure can be adjusted by moving adjustable wing nuts 298 along the threads of stud bolts 299 which extend upward from the frame of the machine.

The preferred embodiment of the invention has been described, but changes and modifications can be made, and some features of the invention can be used alone or in different combinations, without departing from the invention as defined in the claims.

What is claimed is:

1. Apparatus for applying covers to index tabs, said apparatus including an assembly station, feed mechanism for moving a sheet, with an index tab on its forward edge, across the assembly station, a feeding device that advances tab covering material from a supply source to the assembly station, said device including apparatus that folds the material double as it passes from the supply source to the assembly station, driving mechanism that operates the feeding device in timed relation with the sheet feeding mechanism for supplying a tab cover to the assembly station after each sheet has passed across the assembly station, a holder for retaining the tab cover in position to have the open side of the fold engaged by the tab on the leading edge of the sheet as the sheet reaches the assembly station, mechanism that seals the tab cover to the sheet including elements above and below the sheets that clamp the tab cover and sheet between them, and driving means that move said elements and the sheet longitudinally along said apparatus and away from the assembly station.

2. Tab covering apparatus comprising an assembly station, mechanism for feeding sheets having index tabs portions to the assembly station, applicators along the course of travel of the sheets in position to apply adhesive liquid to the surfaces of the sheet over which the cover is to extend, a feeding device for moving a tab cover to the assembly station and into the path of the tab portion of the sheet to which the cover is to be applied, apparatus that bends the tab cover double before a sheet is brought into engagement with the tab cover at the assembly station, mechanism that seals the tab cover to the sheet including elements above and below the sheets that clamp the tab cover and sheet between them, and driving means that move said elements and the sheet longitudinally along said apparatus and away from the assembly station.

3. Apparatus for covering index tabs of sheets, said apparatus comprising a guideway, mechanism for moving successive sheets along the guideway, an applicator for applying liquid to the tab portion of each sheet, a conveyor that moves the applicator along the path of the sheet to provide a substantial period of contact between the applicator and the sheet, an assembly station at the end of the guideway, a feeding device for advancing a folded strip of transparent material intermittently to the assembly station with the open side of the fold toward the sheets as they advance along the guideway, a cutter operated in timed relation with the mechanism for moving the sheets for severing selected lengths of material from the end of the strip to make successive tab covers, a holder at the assembly station for retaining the fold of the tab cover open in the path of the next sheet advancing along the guideway, a conveyor for moving the sheet and tab cover beyond the assembly station, and sealing means for holding the inside surfaces of the tab cover firmly against the sheet for a predetermined time as the sheet moves beyond the assembly station.

4. An automatic tab covering machine comprising an assembly station, mechanism for feeding successive sheets to the assembly station, a feeding device for supplying tab covers to the assembly station in the path of the advancing sheets, said feeding device including apparatus that folds the tab cover before it is engaged by the sheet at the assembly station, and apparatus including elements located both above and below the sheets and that clamp the tab covers and sheets between them for applying heat and pressure to each tab cover, and driving means that advance said element with the clamped tabs and sheets beyond the assembly station.

5. Apparatus for applying covers to index tabs of sheets, said apparatus comprising an assembly station, a guideway along which successive sheets are advanced to the assembly station, an applicator that applies a sealing liquid to an area of each sheet over which the tab cover is to be placed, a feeding device that intermittently advances a folded strip of tab covering material to the assembly station with the open side of the fold facing the guideway, a cutter for detaching predetermined lengths of the material from the strip at the assembly station to form an open loop of the material, a holder for retaining the loop open and in the path of a sheet as the sheet advances, apparatus including clamping elements that travel longitudinally with the sheet for applying pressure to the tab cover for a preselected period as the sheet and tab cover move beyond the assembly station, and other apparatus including clamping elements that travel longitudinally with the sheet for applying pressure and heat to the tab cover after the sheet has moved beyond the pressure sealing apparatus.

6. A tab covering machine comprising an assembly station, mechanism for feeding to the assembly station sheets having index tab portions along the leading edges thereof, a feeding device that advances tab covering material from a supply source to the assembly station, said device including apparatus that folds the material double as it passes from the supply source to the assembly station, driving mechanism that operates the feeding device, a cutter that severs a tab cover from the tab covering material, a holder at the assembly station for retaining a tab cover in position to be engaged by the tab portion of a sheet as the sheet moves across the assembly station, means for holding the tab cover in firm contact with the sheet as the sheet and tab cover move away from the assembly station, said means including elements that contact with the sheet and cover and that travel longitudinally with said sheet and cover for a substantial distance beyond the assembly station, and a heater along a portion of the path followed by said elements and in position to touch said elements and to heat them by conduction.

7. A tab covering machine including an assembly station, a device for supplying successive tab covers to the assembly station, a guideway along which sheets with index tabs are supplied to the assembly station, liquid applicators with supports along which the applicators move with successive sheets, mechanism for feeding the sheets in timed relation with the movement of the applicators so that the applicators contact with the index tab portion of the sheets as they travel toward the assembly station, and a second group of applicators on supports that move the applicators along the path of travel of the sheets and in position to contact with the sides of the sheets directly opposite to the regions with which the first applicators contact.

8. Apparatus for applying covers to index tabs of sheets, said apparatus including an assembly station, a feeding device for supplying successive tab covers to the assembly station, mechanism for feeding successive sheets to and across the assembly station, other feed means including

gripping elements that seize the assembled tab cover and sheet at a location beyond the assembly station, and resilient means at the assembly station in position to hold the tab on the sheet until the sheet and tab have moved far enough to be seized by said gripping elements.

9. An automatic tab covering machine including mechanism for feeding successive sheets of paper to an assembly station, a feeding device for supplying a strip of tab covering material to the assembly station, said feeding device including mechanism for causing intermittent feed of the tab covering material to and across the assembly station in a direction transverse of the direction of movement of the sheet to the assembly station, a stop that determines the extent of the material feed across said station, said feeding device including apparatus that folds the tab covering material double as said material is fed to the assembly station, a cutter at the assembly station and adjacent the course of the tab covering material, a support for the cutter adjustable transversely across the assembly station in the direction of the covering material feed, and apparatus controlled by the paper feeding mechanism for moving the cutter and its support with respect to the material to sever the material that has passed beyond the cutter.

10. An automatic machine for applying covers to the index tabs of sheets, said machine including mechanism for feeding successive sheets to an assembly station, a feeding device that intermittently supplies a strip of transparent tab covering material to and across the assembly station in a direction transverse of the direction of movement of the sheet to the assembly station, a stop that determines the extent of the material feed across said station, said feeding device including apparatus that folds and creases the material as said material is fed to the assembly station, said apparatus having means that cause the open side of the fold to face in the direction from which the successive sheets are supplied to the assembly station, and a cutter operated intermittently in timed relation with the sheet feeding mechanism and a support for the cutter adjustable transversely across the assembly station in the direction of the covering material feed for severing sections from the end of the folded covering material.

11. The machine described in claim 10 and in which a heater located along the path of the transparent material supplies heat to facilitate the folding and creasing of said material, and a finger at the assembly station engages the fold of the material to hold the fold opened until it is engaged by the leading edge of a paper sheet moving into the assembly station.

12. A fully automatic machine for covering index tabs of sheets, said machine including a guideway, mechanism for moving successive sheets of paper along the guideway, an automatic paper feed for removing sheets from the top of a stack one at a time and placing each successive sheet on the guideway, an assembly station at the end of the guideway, a support for a strip of transparent tab covering material, feeding mechanism for moving the end of the strip intermittently to the assembly station with the strip folded and with the open side of the fold facing in the direction from which the paper is moved to the assembly station, a cutter along the path of the strip material and in position to cut off a predetermined length of the end of the strip to make a tab cover, apparatus for moving the assembled tab covers and sheets from the assembly station, sealing apparatus beyond the assembly station in position to press the tab covers into intimate contact with the sheets to secure said tab covers to the sheets, and mechanism for operating the sheet feeding mechanism, the strip feeding device and the cutter in timed relation with one another.

13. An automatic machine for applying covers to index tabs, including an assembly station, a conveyor that supplies sheets to the assembly station, means for bringing a tab cover and the tab portion of a sheet into assembled relation at the assembly station, and a second conveyor in position to take sheets from the position to which they are brought by the first conveyor and to move the assembled tab covers and sheets beyond the assembly station, said second conveyor including elements that grip each successive tab cover and sheet under pressure sufficient to hold them in firm contact with one another, and carrier means that move the clamping elements longitudinally with the sheets away from the assembly station.

14. A machine for putting covers on index tabs of sheets, said machine including a conveyor, automatic sheet feeding mechanism that lifts successive sheets from the top of a stack and places them on the conveyor, an assembly station at the discharge end of the conveyor, a device holding index tab covers in position to engage with the tabs of successive sheets as the sheets come from the conveyor, guideways along the conveyor, means for adjusting the guideways and the automatic sheet feeding mechanism transversely of the direction of movement of the conveyor to shift the position at which the sheets are fed to the assembly station, and a second conveyor in position to take sheets from the position to which they are brought by the first conveyor and to move successive assembled covers and sheets away from the assembly station, said second conveyor including elements that grip the tab cover and sheet under pressure sufficient to hold them in firm contact with one another, and carrier means that move the clamping elements longitudinally with the sheets away from the assembly station.

15. A tab covering machine including a supply station for index sheets having tabs that are to be covered, an assembly station at which tab covers and sheets are brought into assembled relation, a conveyor comprising an endless chain with elements that contact the respective sheets to advance them to the assembly station, another conveyor in position to take sheets from the position to which they are brought by the first conveyor and to move the sheets and tab covers assembled with the sheets away from the assembly station, the second conveyor including upper and lower endless elements that grip the sheets and tab covers between them with sufficient pressure to hold said sheets and tab covers in firm contact with one another as they travel away from the assembly station.

16. An automatic tab covering machine including a supply station at which index sheets are stacked, automatic feeding mechanism that removes one sheet at a time from the top of said stack, a conveyor on which the successive sheets are placed by the automatic feeding mechanism, said conveyor comprising an endless chain with elements that contact the sheets to advance them to an assembly station, means at the assembly

station for holding a tab cover in position to be engaged by a sheet advanced by the conveyor, and a second conveyor in position to take sheets from the position to which they are brought by the first conveyor and to move the sheets and tab covers assembled with the sheets away from the assembly station, the second conveyor including upper and lower endless elements that grip the sheets and tab covers between them with sufficient pressure to hold said sheets and tab covers in firm contact with one another as they travel away from the assembly station.

17. Apparatus for attaching covers to the index tabs of sheets, including an assembly station at which the sheets and tab covers are brought into engagement with one another, a conveyor for supplying sheets to the assembly station, a second conveyor beyond the assembly station and comprising upper and lower endless chains with elements on the chains in position to grip the assembled covers and sheets between them, and a third conveyor for advancing the sheets with their attached tab covers after they leave the second conveyor, said third conveyor including upper and lower endless chains with elements thereon for gripping the tab cover and sheet between them, and heating means for maintaining the gripping elements of the third conveyor at a high temperature.

18. Apparatus for attaching covers to the tabs of index sheets, said apparatus including an assembly station at which the tab covers and sheets are brought into assembled relation, means for supplying sheets successively to the assembly station, a second conveyor for moving the assembled index tabs and sheets from the assembly station, said second conveyor including upper and lower endless chains with elements attached to the chains in such spaced relation that certain elements of the upper and lower chains grip the tab covers and sheets under substantial pressure, and the next successive elements of the endless chains grip the sheets beyond the tab covers for continuing the advance of the sheets after the tabs with the tab covers have moved beyond the endless chains, and a third conveyor in position to take the assembled tab covers and sheets as the tab covers are released by the second conveyor and before the remainder of each sheet is released by the second conveyor.

19. Tab cover attaching apparatus comprising a supply station for a stack of sheets having tabs to which covers are to be applied, an assembly station at which tab covers and sheets are brought into engagement with one another, a conveyor between the supply station and the assembly station including upper and lower endless chains with absorbent pads connected thereto in position to grip the sheets at the regions where the tab covers are to be applied, means for supplying liquid to the pads during a portion of the travel of the pads with the endless chains, and other conveyor means beyond the assembly station including elements that apply heat and pressure to each successive assembled tab cover and sheet.

20. A machine for attaching covers to index tabs of sheets including, in combination, a supply station, an assembly station, a conveyor between the supply station and the assembly station, said conveyor comprising upper and lower endless chains with absorbent pads that grip the sheets over the areas of the sheets to which the tab covers are to be applied, means for supplying liquid to the absorbent pads, a device for holding an index tab cover at the assembly station in position for engagement with the tab portions of the sheets, a second conveyor beyond the assembly station and including upper and lower endless chains with elements attached to the chains in position to grip and press the tab cover and sheet as they come from the assembly station, a third conveyor including upper and lower endless chains with heating plates attached to the chains in position to grip the assembled tab covers and sheets under controlled pressure and heat as the assembled tab covers and sheets come from the second conveyor, means for adjusting the pressure exerted by the heating elements of the third conveyor, a motor, and motion transmitting connections through which all of the conveyors are operated from said motor in timed relation with one another.

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