April 15, 1941. R. A. WILLIAMS 2,238,356

UNIT STRIP MACHINE AND METHOD

Filed Sept. 5, 1939 11 Sheets-Sheet 1

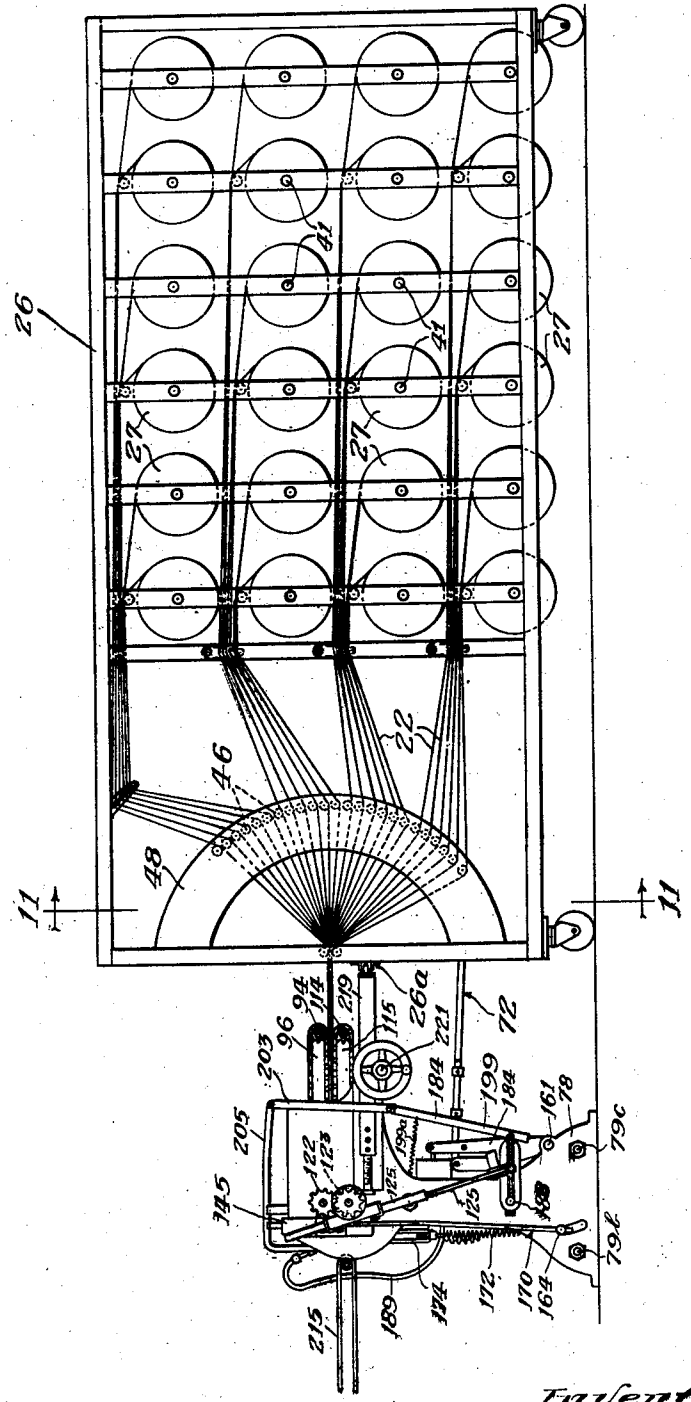


Fig. 1.

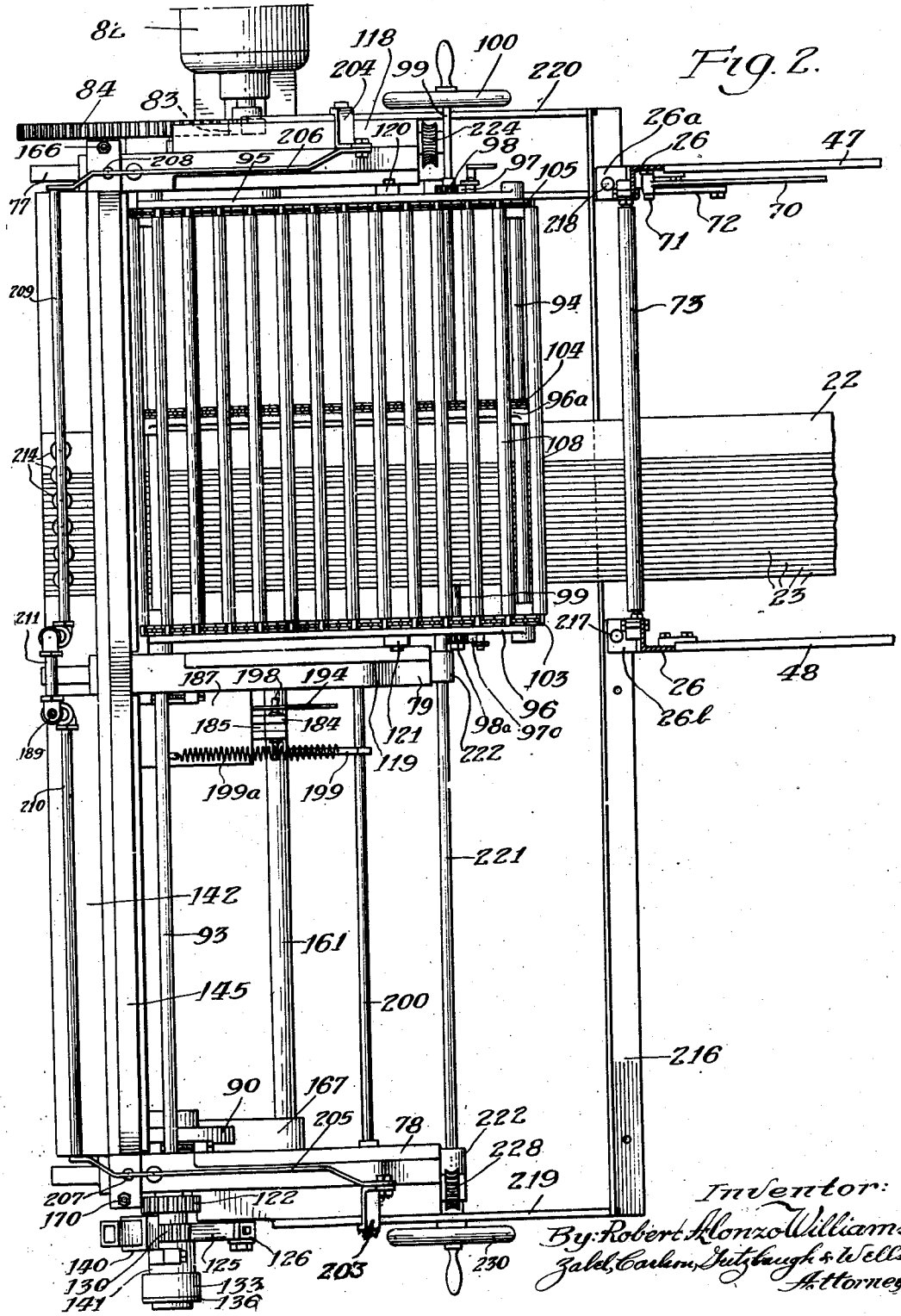
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April 15, 1941. R. A. WILLIAMS 2,238,356

UNIT STRIP MACHINE AND METHOD

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Fig. 2.



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UNIT STRIP MACHINE AND METHOD

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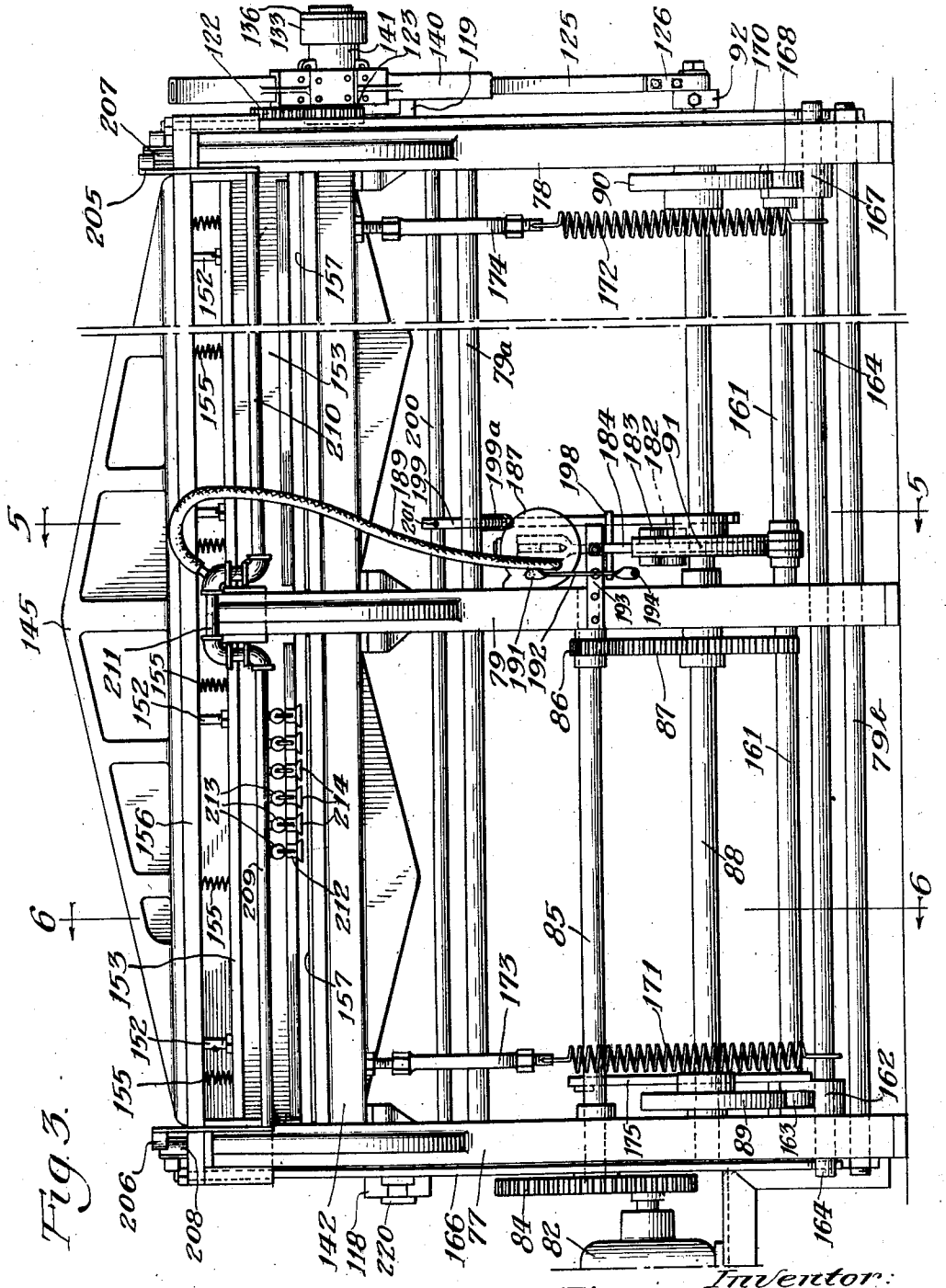


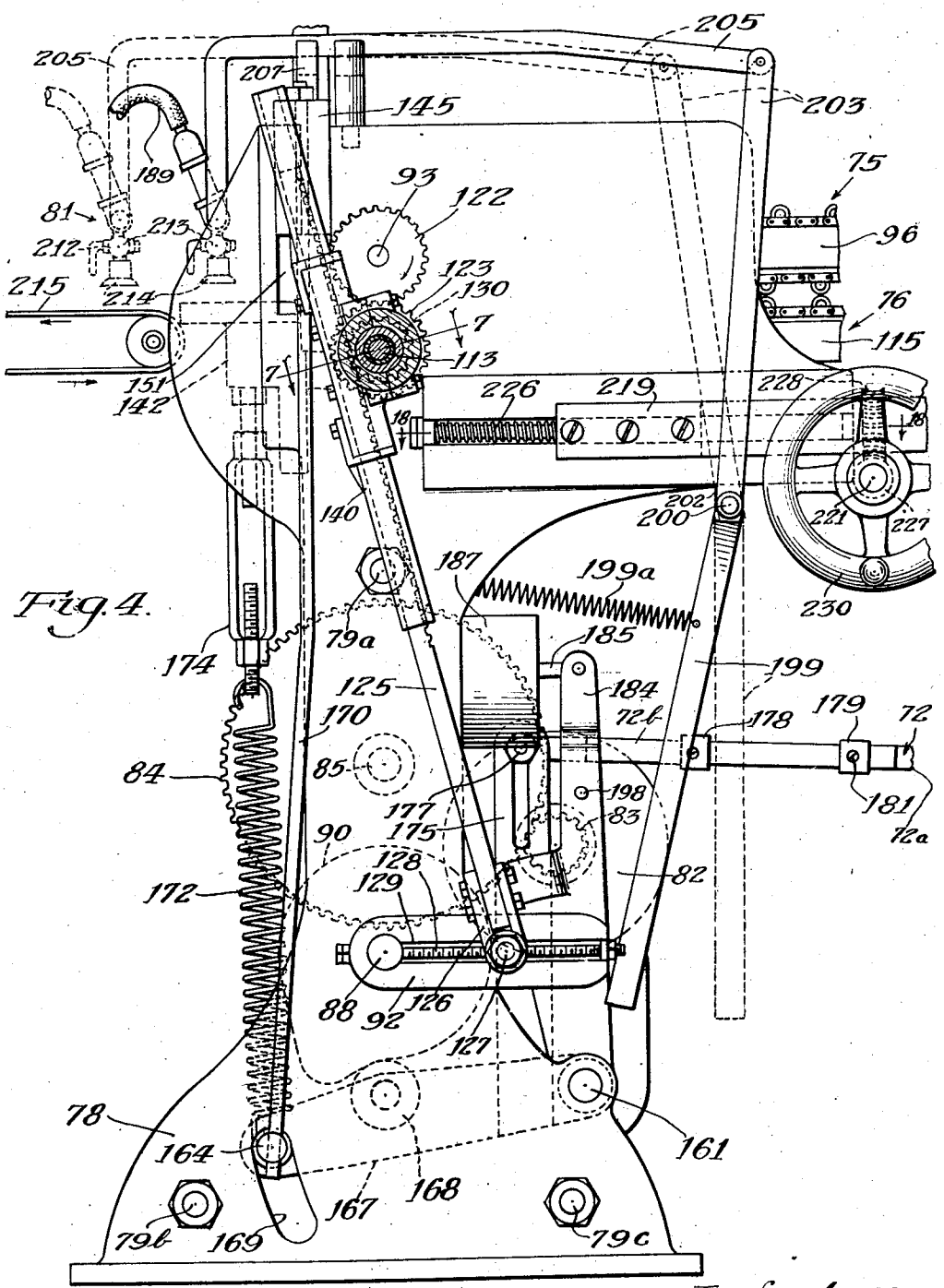
Fig. 3.

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UNIT STRIP MACHINE AND METHOD

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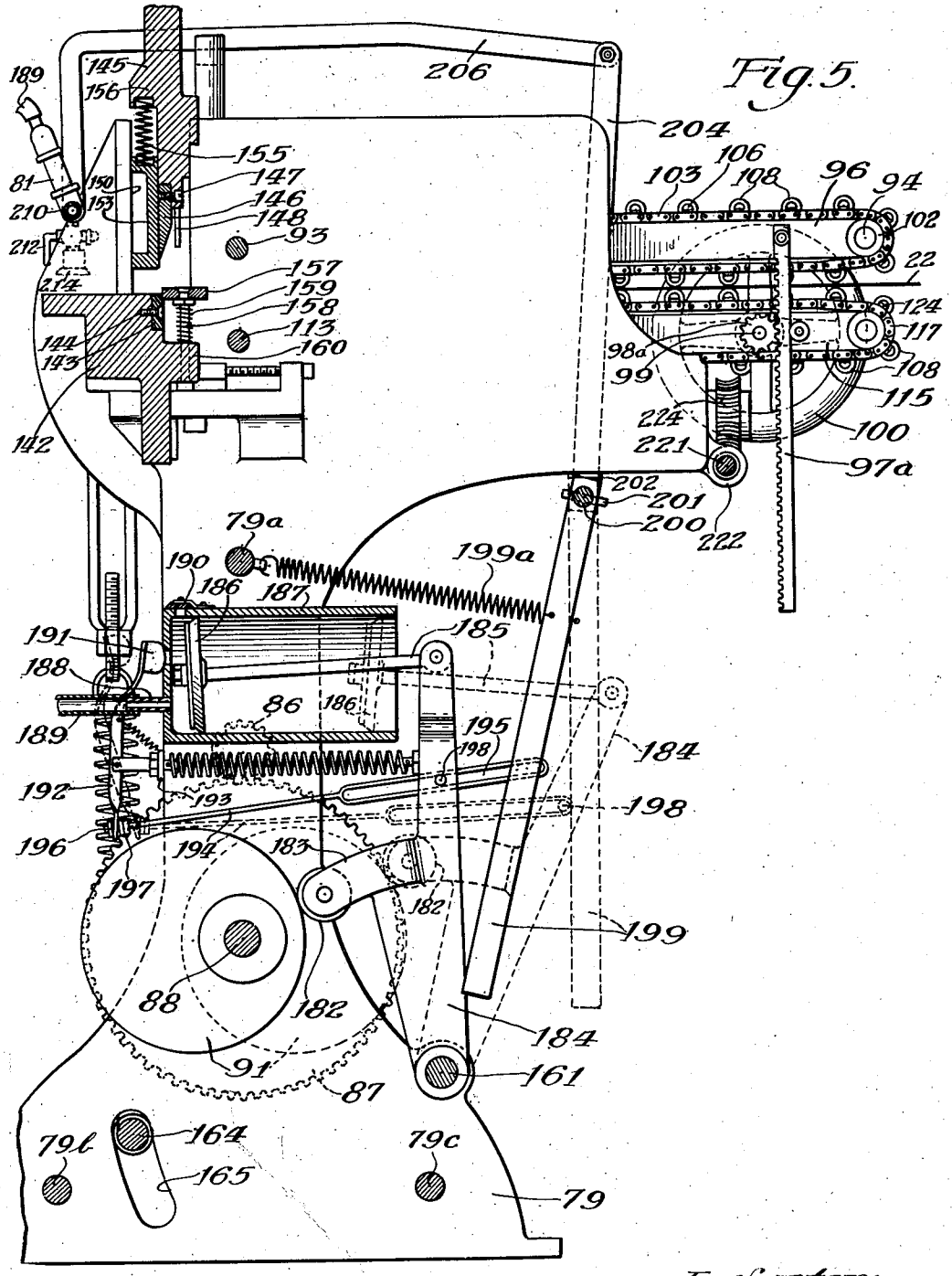
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UNIT STRIP MACHINE AND METHOD

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Fig. 5.



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UNIT STRIP MACHINE AND METHOD

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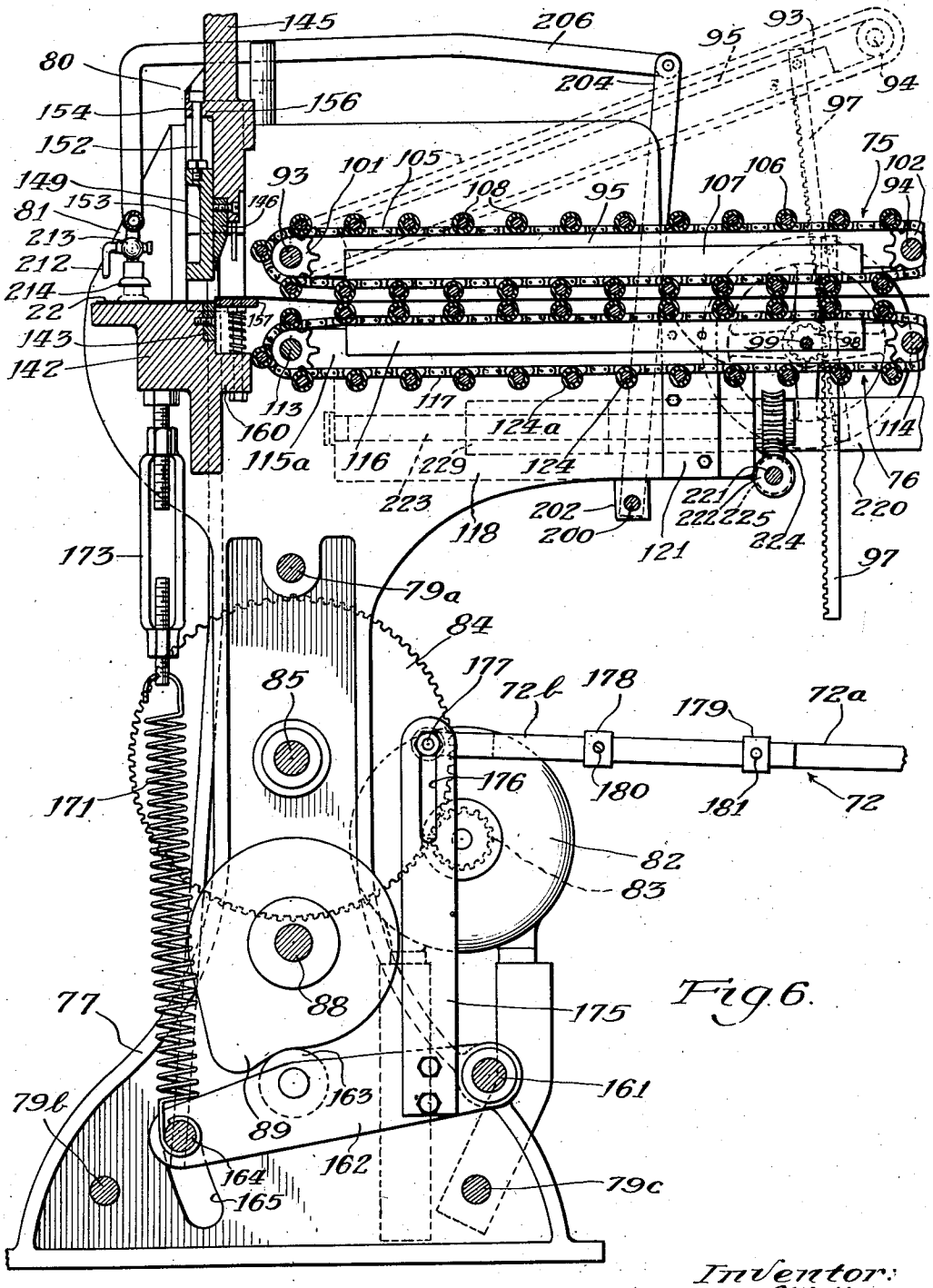


Fig. 6.

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UNIT STRIP MACHINE AND METHOD

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Fig. 7.

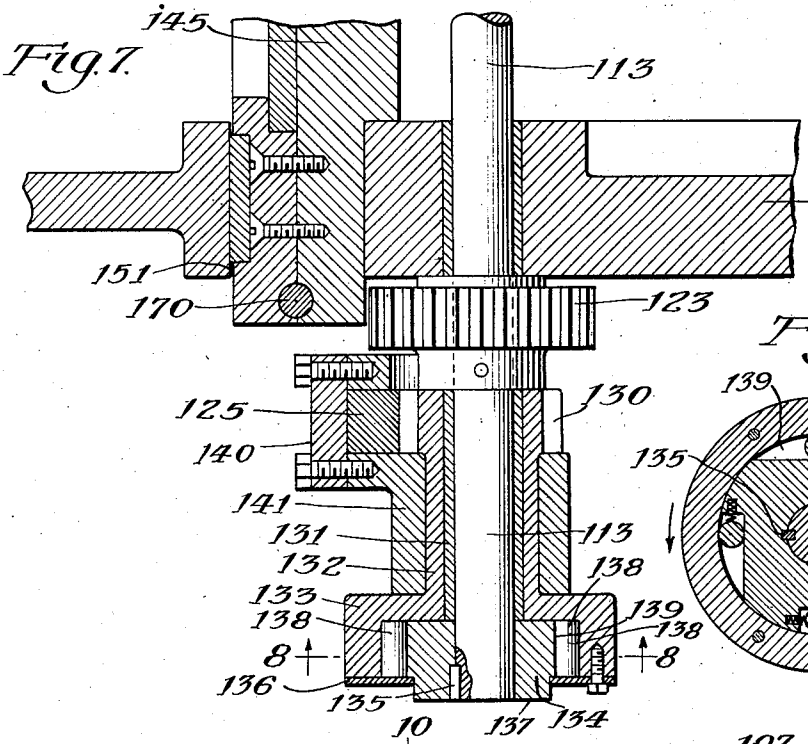


Fig. 8.

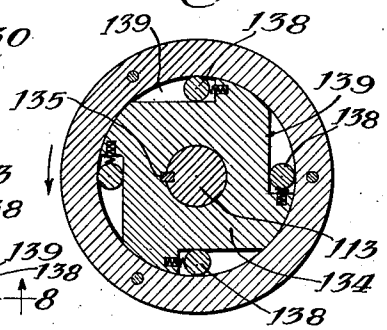


Fig. 9.

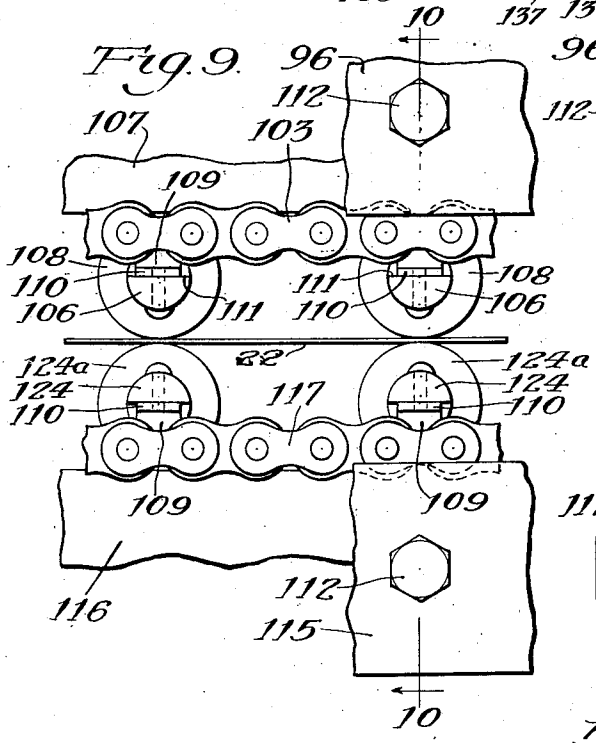
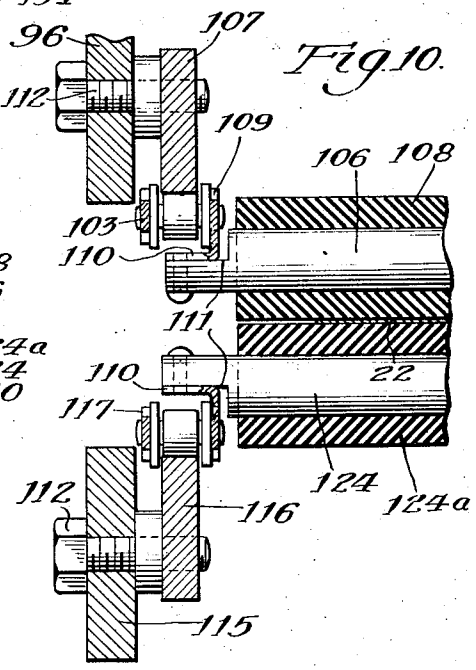


Fig. 10.



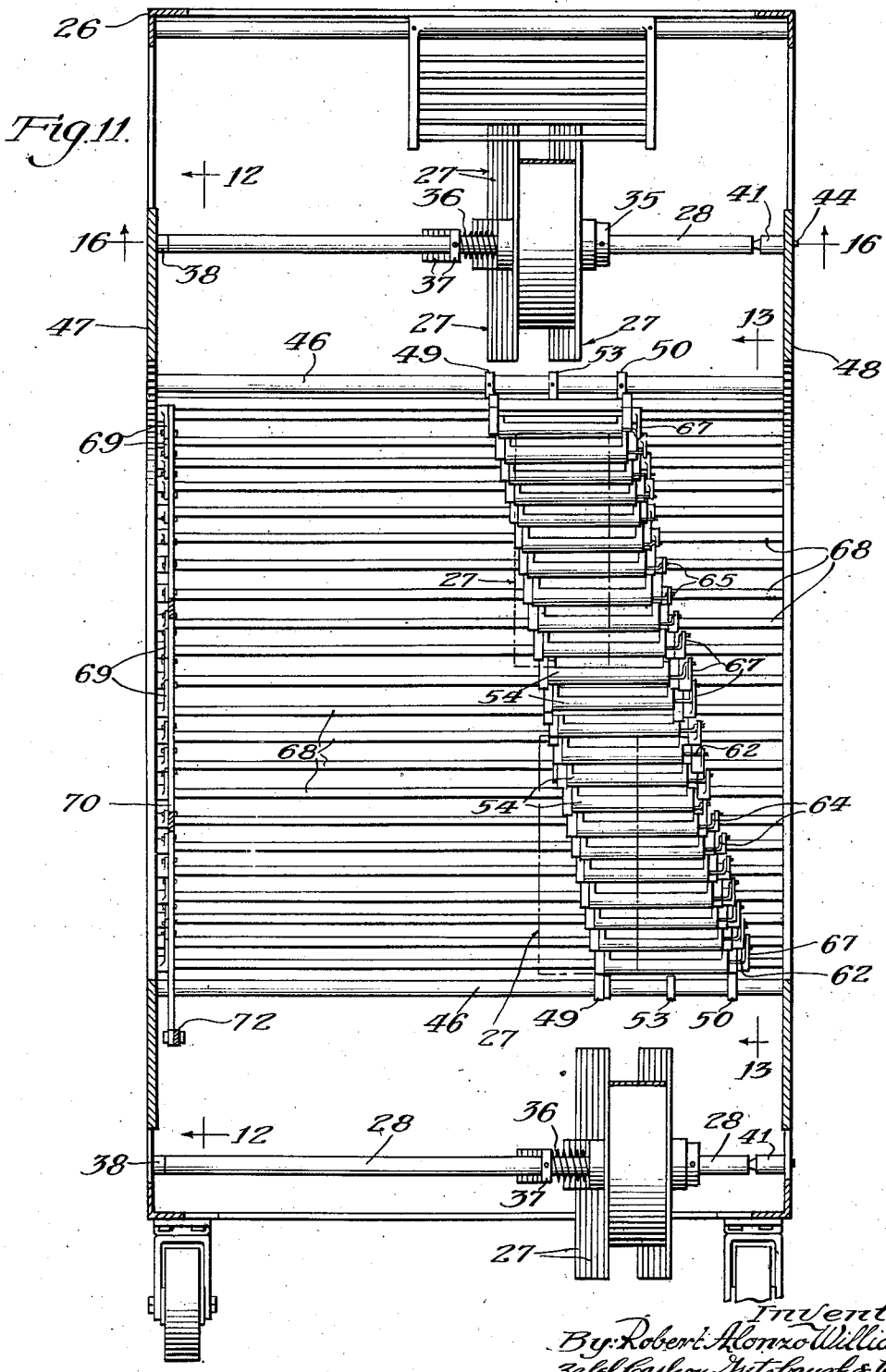
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UNIT STRIP MACHINE AND METHOD

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Fig. 11.



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UNIT STRIP MACHINE AND METHOD

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Fig. 13.

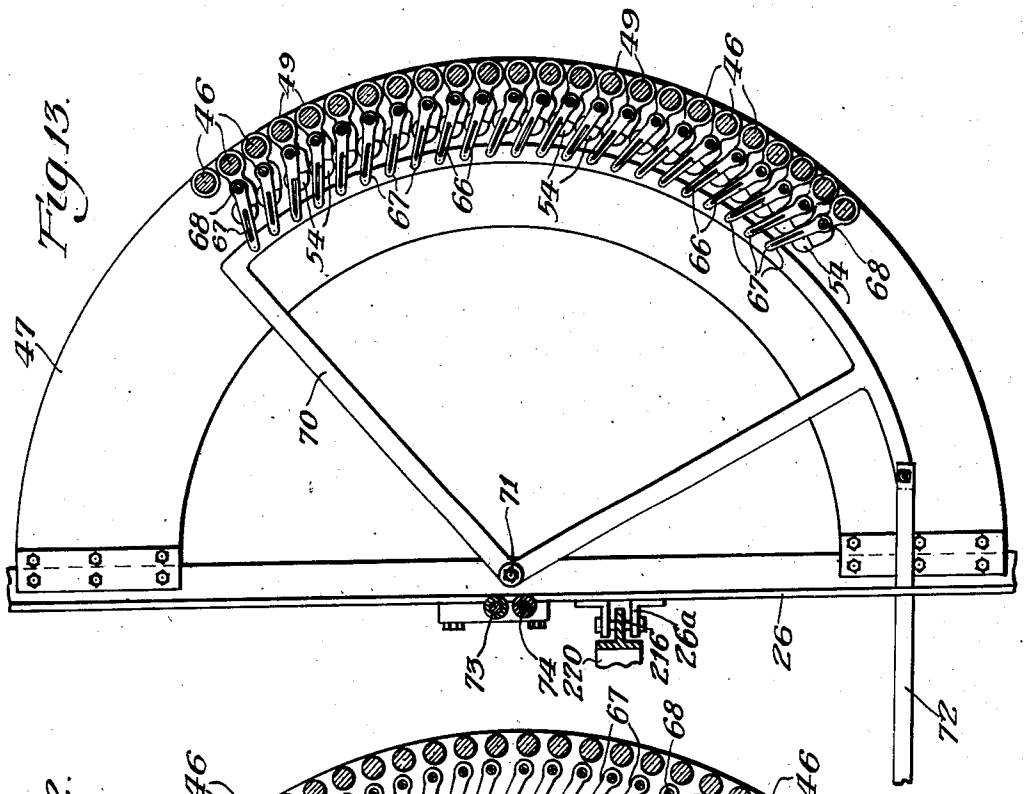
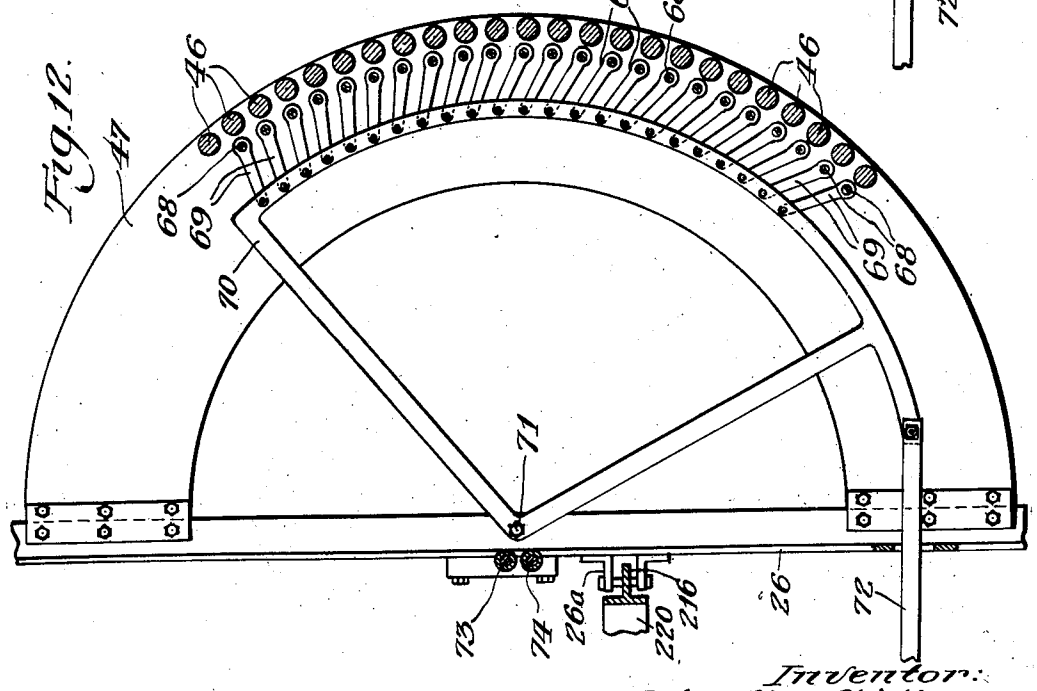


Fig. 12.



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UNIT STRIP MACHINE AND METHOD

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Fig. 14.

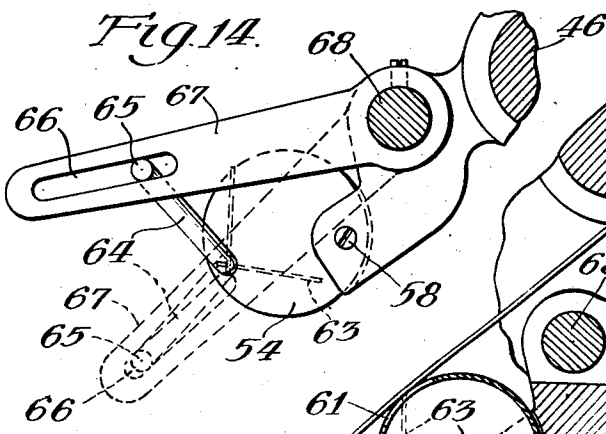


Fig. 15.

Fig. 17.

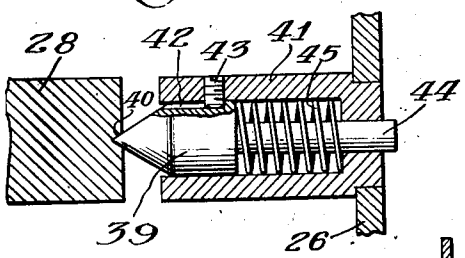
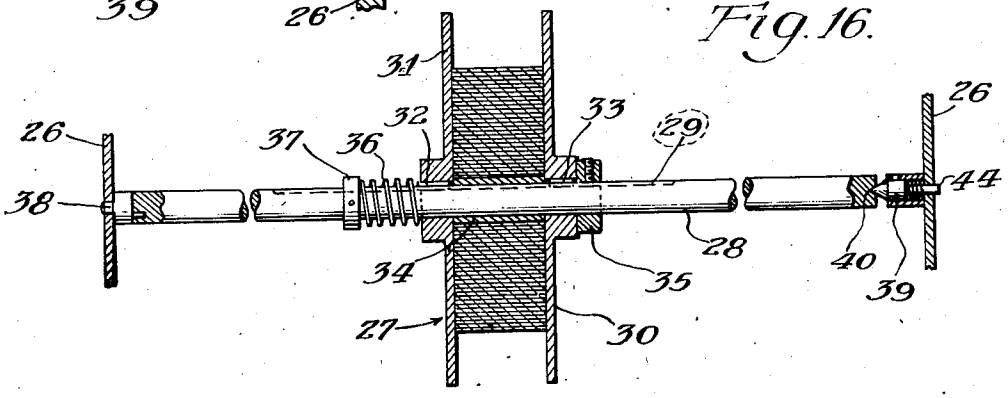


Fig. 16.



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UNIT STRIP MACHINE AND METHOD

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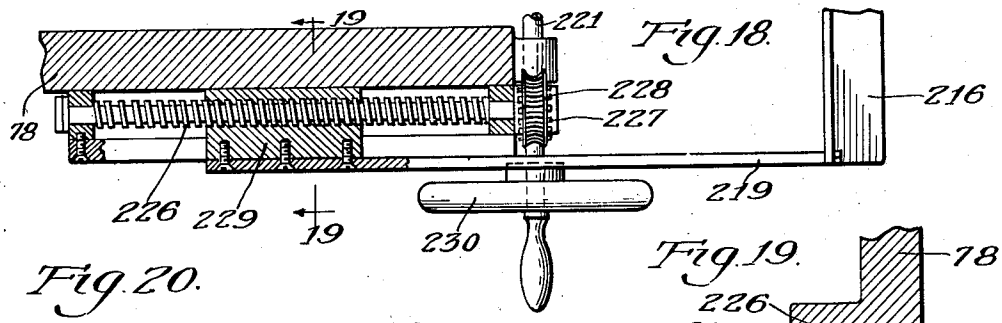


Fig. 18.

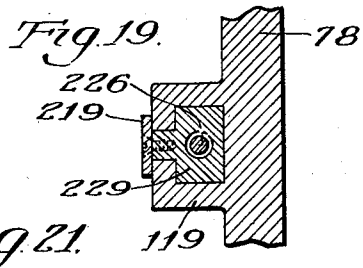


Fig. 19.

Fig. 20.

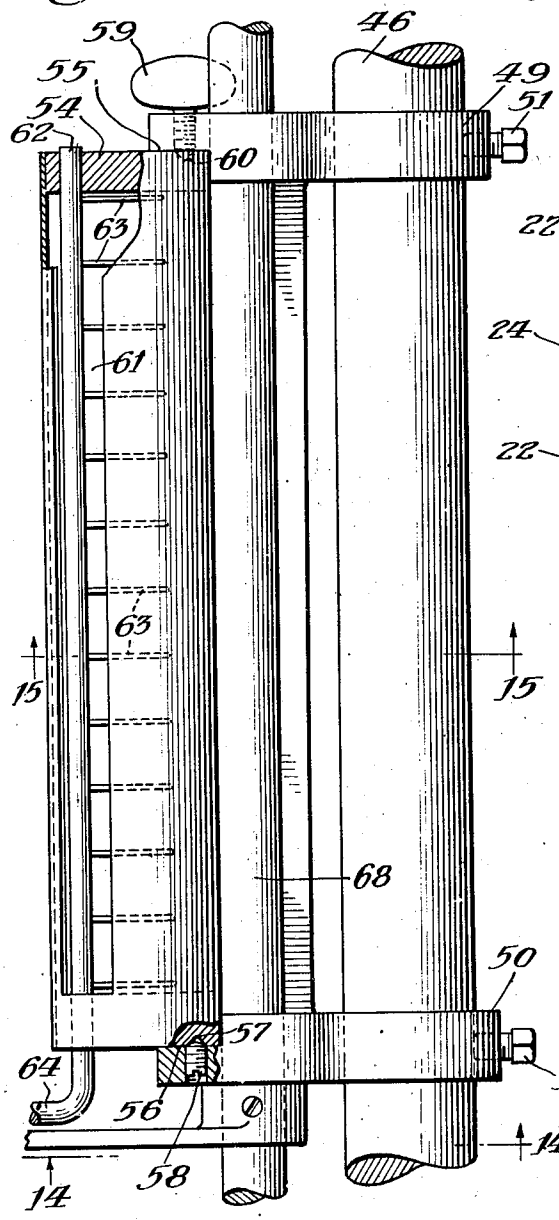
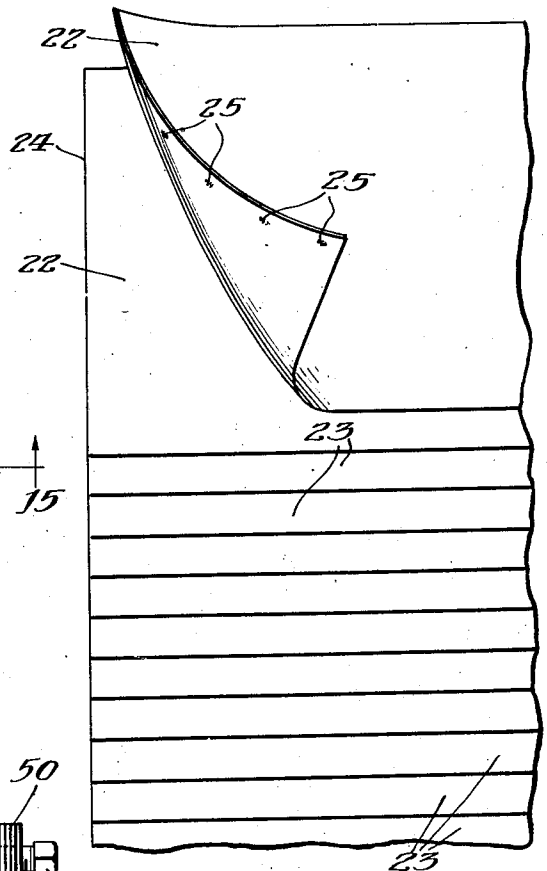


Fig. 21.



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Patented Apr. 15, 1941 2,238,356

UNITED STATES PATENT OFFICE

2,238,356

UNIT STRIP MACHINE AND METHOD

Robert Alonzo Williams, Chicago, Ill., assignor to Ditto, Incorporated, Chicago, Ill., a corporation of West Virginia

Application September 5, 1939, Serial No. 293,452

32 Claims. (Cl. 270—52)

The present invention relates to sheet assembling apparatus and methods by which a plurality of sheets may be assembled in groups of the desired number with a portion of each sheet adjacent to one edge thereof exposed to receive a legend. The several sheets are desirably secured together in such a way that they may be readily pulled apart, and in such a way that the securing of the sheets together does not interfere with the placing of a legend on the exposed part of each sheet. Preferably, the several sheets of each group are secured to each other along an edge which is at right angles to the edges of the exposed portions. The number of sheets in a group may be varied to fit the particular purpose for which the sheets are used. The sizes of the sheets may be varied, also.

The present invention has for its principal object the provision of an apparatus and method whereby units composed of a plurality of sheets may be rapidly assembled from webs of paper or like material as a continuous process. The invention contemplates the assembling of a plurality of webs from suitable spools into overlapped relationship, the securing of the webs together at longitudinally spaced intervals, and subsequent cutting of the webs along lines adjacent to the points of securement so that each cut will produce a unit strip comprising the several sheets in overlapping relationship.

It is also a purpose of the present invention to provide a sheet assembling apparatus of the character described wherein a novel means is employed for securing the several sheets together, the novel means comprising an adhesive applying device adapted to apply adhesive to the sheets in small areas or dots which are placed adjacent to one edge of the sheet and are spaced from each other lengthwise of the edge.

It is a further purpose of this invention to provide a machine of the character described with means whereby adhesive material may be applied in rows extending transversely across the webs which are assembled, the rows being spaced uniformly lengthwise of the web. In this connection, the invention contemplates an adhesive applying device having fingers which are adapted to engage the web at spaced points along a line extending across the web and means are provided whereby the operation of the fingers is timed to occur while the web is stationary.

More specifically, it is the purpose of the present invention to provide a sheet assembling apparatus wherein the several webs are supported and guided into overlapping relationship so that a portion of each web is exposed when the several webs are brought into engagement with each other, together with means for applying an adhesive between the webs before they are brought into overlapped relationship, and means for cutting the overlapped webs to provide units of sheets.

The features and advantages of the present invention will appear more fully as the description proceeds, reference being had to the accompanying drawings wherein a preferred form of the invention is shown.

In the drawings,

Fig. 1 is a view in side elevation of a machine adapted to carry out the present invention;

Fig. 2 is a plan view of the left-hand end of the machine shown in Fig. 1;

Fig. 3 is an end view looking at the machine from the left-hand end, as shown in Fig. 1;

Fig. 4 is an enlarged fragmentary side view, partly in section, illustrating the mechanism shown in Fig. 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 3;

Fig. 7 is an enlarged fragmentary sectional view taken on the line 7—7 of Fig. 4 and illustrating a portion of the drive mechanism;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7;

Fig. 9 is an enlarged fragmentary side view of a portion of the web advancing mechanism shown in plan view in Fig. 2;

Fig. 10 is a sectional view taken on the line 10—10 of Fig. 9;

Fig. 11 is an enlarged sectional view taken on the line 11—11 of Fig. 1;

Fig. 12 is a fragmentary sectional view taken on the line 12—12 of Fig. 11;

Fig. 13 is a fragmentary sectional view taken on the line 13—13 of Fig. 11;

Fig. 14 is an enlarged fragmentary end view of one of the adhesive applying mechanisms shown in Fig. 13;

Fig. 15 is a fragmentary sectional view taken through a plurality of the adhesive applying mechanisms shown in Fig. 13;

Fig. 16 is a sectional view taken on the line 16—16 of Fig. 11;

Fig. 17 is an enlarged fragmentary sectional view of the right-hand end of the mechanism shown in Fig. 16;

Fig. 18 is a fragmentary sectional view taken on the line 18—18 of Fig. 4;

Fig. 19 is a sectional view taken on the line 19—19 of Fig. 18;

Fig. 20 is a fragmentary plan view, partly in section, of one of the adhesive applying units shown in section in Fig. 15, and

Fig. 21 is a fragmentary plan view of an assembled unit of sheets such as are produced by the present apparatus and method.

Referring now in detail to the drawings, and particularly to Fig. 21, there is shown in this figure a plurality of sheets 22 which sheets are arranged one upon the other in overlapping relationship so that a portion 23 of each sheet is exposed. This portion of the sheet is adapted to receive a legend such as a line of printed information. It will be evident, of course, that the width of the exposed portion 23 will of necessity be different for different uses of the unit of sheets, and the size of each sheet in the unit may be different for different purposes. The several sheets 22 are adapted to be secured together along their side edges 24 by applying an adhesive material 25, such as glue, between the several sheets. This adhesive material is preferably applied in small areas along a line adjacent to the edge 24 of each sheet. The small areas 25 are shown in Fig. 21 as being arranged in a row running lengthwise of the edge 24, the several small areas or dots being spaced apart uniformly.

The method of making the unit strips from the sheets 22, as specifically shown in the present application, comprises the supporting and guiding of a plurality of webs of paper or like sheet material so that the several webs are placed one upon the other with a longitudinally extending portion of each web exposed. The several webs receive transversely extending rows of the small areas of adhesive 25 before they are brought into engagement with each other. The adhesive is applied to the undersurface of each web except the bottom web. This web adheres to the next web above it because of the adhesive on the lower surface of said next web. The rows of adhesive areas are spaced at uniform distances lengthwise of the several webs so that when the webs are brought together the rows of adhesive are superposed. The several overlapping webs are advanced as a unit and pressed together so as to cause the adhesive to stick to both adjacent webs. Then the overlapped webs are sheared along lines adjacent to the rows of adhesive, to form the unit strips.

In Fig. 1 there is shown a web supporting frame 26 having a multiplicity of web carrying spools 27 removably mounted therein. The construction of the spools is that shown in Figs. 16 and 17. A shaft 28 has a longitudinal key-way 29 thereon. A plurality of discs 30 and 31 are keyed to the shaft 28 by keys 32 and 33. Between the discs 30 and 31 a web carrying sleeve 34 is rotatable upon the shaft 28. A collar 35 acts as a shoulder to limit the endwise movement of the disc 30, while a spring 36 and a collar 37 are arranged to press the disc 31 toward the disc 30. The pressure of the spring 36 is fairly light, but is sufficient to snugly hold the discs against the web retaining sleeve 34. It will be understood that it is a simple matter to replace a web by removing one of the discs 30 from the shaft 28 and threading a new web carrying sleeve 34 upon the shaft 28.

The shaft 28 is removably mounted in the frame 26. It has a pin 38 engaging in an opening in one side of the frame 26. The other side of the frame 26 carries a spring pressed bearing pin 39 which is adapted to engage in a conical seat 40 in the end of the shaft 28. The bearing pin 39 is housed in a shell 41 that is fixed to the frame 26. The pin 38 has a groove 42 therein, and a screw 43 in the shell 41 rides in the groove 42 to limit the outward movement of the pin 39. The pin 39 has a reduced shaft 44 which projects through the end of the shell 41. A spring 45 is seated in the shell 41 so as to press the pin 39 outwardly.

Referring now to Figs. 1 and 11, it will be noted that from the several web supports 27 the webs are carried forward over suitable guides in the frame 26, and threaded between a multiplicity of guide rods 46. The guide rods 46 are mounted upon and extend between two semi-circular side frame members 47 and 48 of the frame 26. It will be noted from Fig. 1 that the several rods 46 are so arranged with respect to the approaching webs that all of the webs bear on the lower surfaces of the rods. This is for convenience in placing the webs at the desired position. It will also be observed from Fig. 11 that the several web supports 27 are so positioned endwise of their respective shafts that each web from the top to the bottom is stepped farther to the right. Each of the rods 46 carries two spaced brackets 49 and 50 which are capable of being adjusted lengthwise of the rods by releasing their set screws 51 and 52. Each of the rods also carries an adjustable collar 53 which may be moved toward either of the brackets 49 or 50. Each of the brackets 49 is preferably aligned with one of the discs 31 of the several web supports. The collars 53 are set to align with the discs 30 of the corresponding web supports. Thus the webs fed from the supports are guided by the brackets 49 and the collars 53 into overlapped relationship so as to give the desired amount of exposed portions 23 on the ultimate sheets.

The brackets 49 and 50 are each adapted to removably support an adhesive container 54 (see Figs. 14, 15 and 20). The containers 54 seat in recesses 55 and 56 which are cut in the brackets 49 and 50. Each container has a concave socket 57 adapted to receive a pointed screw 58 that is threaded in the bracket 50. A thumb screw 59 is threaded in the bracket 49 and has a pointed end adapted to engage in a similar conical socket 60 provided in the adjacent end of the adhesive container 54. Each container 54 has an opening 61 in the top thereof and a rock shaft 62 is journalled in the ends of the container 54. This rock shaft carries a plurality of fingers 63 which are adapted to swing between a position shown in full lines in Fig. 15 within the adhesive material in the container 54 to a position where they project through the opening 61. Each of the rock shafts 62 has an arm 64 bent at right angles to the shaft outside of the container 54. The end of the arm 64 is bent outwardly to provide a connecting portion 65 which extends through a slot 66 provided in a lever arm 67 that is fixed to a rock shaft 68. It will be understood that there is a lever arm 67 and a rock shaft 68 for each of the pairs of brackets 49 and 50. The rock shafts 68 are rotatably journalled in the brackets 49 and 50 and in the side frame members 47 and 48. By actuating the rock shafts 68, the fingers 63 are caused to alternately dip into the adhesive material in the containers 54 and move up into position to engage the webs which pass beneath the rods 46.

The several rock shafts 68 have arms 69 thereon adjacent to the side frame member 47 and these arms are connected to an actuating frame 70. The frame 70 is pivoted to the framework 26 by means of a pivot pin 71, the pin 71 being located substantially at the axial center about which the rods 46 and the rock shafts 68 are arranged in circular paths. The actuating frame 70 is connected by a link 72 to the driving mechanism for the machine, which will be hereinafter more fully described. Across the front of the frame 26 there are two rubber covered guide rolls 73 and 74 to which all of the webs are led after they pass from the rods 46. These rolls are adapted to press the several webs tightly together in overlapped relation. The rolls 73 and 74 also act to force the adhesive between the webs into the material of the webs and to spread it. This prevents the adhesive carrying parts of the overlapped webs from becoming excessively thick as compared to the combined thickness of the webs, where there is no adhesive between them. The rolls 73 and 74 are approximately at the center of the circular path in which the adhesive applying fingers lie.

The several webs, after being placed in overlapped relation, pass between two web advancing means 75 and 76 which supply the necessary force to pull the several webs from their supports and through the path just described. The means 75 and 76 are supported by a plurality of standards 77, 78 and 79, the standards being connected by three tie rods 79a, 79b and 79c. These standards also support a guillotine shear 80, a unit lifting and removing suction mechanism 81 and the driving mechanism for the machine, including a drive motor 82. Before explaining the detailed operation of the advancing means 75 and 76, the driving mechanism for the several parts of the machine will be explained.

The motor 82 has a pinion 83 which meshes with a gear 84 upon a shaft 85. The shaft 85 is journalled in the standards 77 and 79 and carries a small pinion 86 adjacent the standard 79. This pinion meshes with a gear 87 upon a main operating shaft 88 that extends from the standard 77 to the standard 78 and is journalled for rotation in the three standards. The shaft 88 carries a pair of cams 89 and 90, which cams are adapted to control the operation of the shear 80. The shaft 88 also carries an eccentric 91 which is adapted to control the operation of the suction mechanism 81. The shaft 88 extends beyond the standard 78 and at its outer end has fixed thereto a crank arm 92 which is adapted to control the advancement of the overlapped webs by the means 75 and 76.

It will be noted that the mechanism as shown in Fig. 2 illustrates only one set of the web advancing means 75 and 76 and only one frame 26. The mechanism is arranged, however, so that another set of advancing means 75 and 76 and another web supporting frame 26 may be readily attached to the machine so as to double its capacity. All of the operating mechanism carried by the standards 77, 78 and 79 is so arranged to operate the same, whether the machine is as shown in Fig. 2 or is of the double capacity type.

Referring now to the web advancing means 75 and 76 and the means for operating the same, the web advancing means 75 comprises two spaced shafts 93 and 94 which are connected together by three bars 95, 96 and 96a. The bars 95 and 96 have lifting racks 97 and 97a pivoted thereto adjacent the shaft 94. These racks mesh with two gears 98 and 98a which are carried by a shaft 99 that has a hand wheel 100 thereon. The shaft 99 is journalled in the lower web advancing means 76. The shafts 93 and 94 have sprocket wheels 101 and 102 thereon, there being three sprocket wheels for each shaft, one at each end thereof and one adjacent to the cross bar 96a. The several sprocket wheels are engaged by three sprocket chains 103, 104 and 105. The chains are connected by a plurality of separate cross rods 106 so as to form a conveyer structure. A plurality of chain guide bars 107 are carried on the bars 95, 96 and 96a. As the conveyer structure passes beneath the framework composed of the shafts 93 and 94 and the bars 95, 96 and 96a, it is directed by the guide bars 107 gradually downward from the point where it leaves the sprocket wheels 102 and then in a straight line to the point adjacent the shaft 93 where it leaves the guides 107 and is directed upwardly. The several cross rods 106 have rubber coverings 108 thereon, these coverings being rubber tubes which are slightly stretched when they are placed upon the rods 106. The rods are connected to the chains 103, 104 and 105 by a plurality of brackets shown best in Figs. 9 and 10. The brackets comprise special links 109 for the chains, which links have extensions 110 bent horizontally beneath the chain and riveted to the rods 106, the rods being cut away, as indicated at 111, to provide flat surfaces for the extended portions 110 of the links. The guide bars 107, which control the direction of the chains 103, 104 and 105, are bolted to their adjacent cross bars 95, 96 and 96a by bolts, one of which is shown in Fig. 10 at 112.

The means 76 is substantially a duplicate in construction of the means 75 with the exception that it is stationary. The means 76 comprises two shafts 113 and 114 connected by three cross bars similar to 95, 96 and 96a. Only one of the cross bars 115 is shown in the drawings, since the others are hidden by the corresponding cross bars of the upper means 75. Suitable guides 116 are provided for holding a plurality of sprocket chains 117 exactly like the chains 103, 104 and 105 in proper opposed relation to the chains 103, 104 and 105. The sprocket chains 117 are connected by a plurality of cross rods 124 that have rubber coverings 124a like the coverings 108. The means 76 is supported from the standards 77 and 79 by two horizontally extending extensions 118 and 119 of the standards and by two brackets 120 and 121 which are carried by the extensions 118 and 119. The shaft 113 is journalled in the standards 77, 78 and 79 and is adapted to be driven by the arm 92 through a suitable mechanism to be described. The shaft 93 also extends through the standard 79 and is journalled in the standard 78. The two shafts 93 and 113 are connected together by two gears 122 and 123 (see Fig. 4).

The function of the rubber covered cross rods 106 and 124 is to grip and move the several overlapped webs step by step to the shear 80. All of the advancement of the webs from their supports 27 is caused by the step by step advancement given the overlapped webs by the rubber covered bars 106 and 124. It is highly essential that this advancement be accomplished without in any way disturbing the overlapped arrangement of the several webs, since uniformity and accuracy in overlapping is the measure of the quality of the product. The rubber covered rods

106 and 124 also serve to apply pressure to the overlapped webs sufficient to cause them to adhere firmly to each other at the points where the adhesive is placed between the webs. It has been found necessary, in order to avoid slippage and distorted alignment of the webs, to have the rods 106 and 124 brought gradually into engagement with the webs. This is accomplished by the guides 107 and 116 which are so shaped as to direct the chains toward each other along gradually approaching lines. Since the overlapped webs are always engaged by several pairs of rubber covered rods, there is no opportunity for relative slipping, and the yielding of the rubber is sufficient to accommodate the irregularities due to the overlap.

Rotation of the shaft 113 and the shaft 93 is accomplished by the mechanism shown most clearly in Figs. 4, 7 and 8. A rack 125 is mounted on an arm 92 by means of a clevis 126 which is pivoted about a bolt 127. The bolt 127 is threaded to receive an adjusting screw 128 which is carried in a slot 129 of the arm 92. Rotation of the screw 128 is utilized to adjust the position of the rack 125 lengthwise of the arm 92 and to thus control the stroke imparted to the rack 125. The rack 125 is adapted to mesh with a gear 130 (see Fig. 7) which gear is journalled on the shaft 113. A sleeve 131 is interposed between the gear 130 and the shaft 113. The gear 123 which is keyed to the shaft 113 abuts the gear 130.

The gear 130 has a hub portion 132 which extends toward the free end of the shaft 113 and has an enlarged annular head 133 thereon. The annular head 133 surrounds a clutch member 134 that is keyed to the shaft 113 by a key 135. A cover plate 136 is mounted over the open end of the head 133. The member 134 has a reduced extension 137 which projects through the plate 136, the reduced portion, of course, being cylindrical. The head 133 and the member 134, together with a plurality of spring pressed rollers 138 and notches 139 in the member 134, constitute what is usually termed an "overrunning clutch" or "one-way drive connection" between the head 133 and the member 134. The head 133 is, of course, oscillated by reciprocation of the rack 125 in engagement with the gear 130. The head 133 is therefore the driving element which, when moved in the direction indicated by the arrow in Fig. 8, causes rotation of the member 134 and the shaft 113. When the head is driven in the opposite direction, the rollers 138 recede toward the deeper portions of the notches 139 and the head is rotated on the member 134. In this way, step by step movement is communicated to the shaft 113 and through the gears 123 and 122 to the shaft 93.

The shafts 93 and 113 drive the web advancing mechanism comprising the means 75 and 76. The degree of advance imparted to the web is controlled by adjusting the effective length of the arm 92 by means of the screw 128. The rack 125 is supported in a housing 140 which is carried by a collar 141 that, in turn, is mounted upon the hub 132 so as to turn on the hub as the rack is adjusted by means of the screw 128.

Referring now to the shear 80, the construction of the shear is shown best in Figs. 3–6 inclusive. The shear comprises a base plate 142 which is carried by the standards 77, 78 and 79. This base plate mounts a stationary knife 143 which is removably secured to the base plate by suitable screws 144. Over the base plate 142 there is mounted a cutter bar 145 which removably supports a movable knife 146. The knife 146 is secured to the bar 145 by suitable screws 147. A plurality of pins 148 depend from the bar 145 alongside the knife 146, these pins being spaced at frequent intervals lengthwise of the bar. The pins 148 terminate somewhat above the cutting edge of the knife 146, as shown clearly in Fig. 5. The standards 77, 78 and 79 have guide grooves 149, 150 and 151 respectively for receiving the bar 145 and guiding it in its vertical reciprocation.

Suspended from the bar 145 by a plurality of bolts 152 is a presser bar 153 which is adapted to engage severed portions of the overlapped webs as the bar 145 descends. The bolts 152 are slidably mounted in the bar 145, as shown in Fig. 6 at 154. A plurality of springs 155 are interposed between the presser bar 153 and a ledge 156 provided on the bar 145. When the bar 145 is pressed downwardly, the bar 153 at first moves down with the bar 145 until it engages the top of the plate 142. Further descent of the bar 145 then results in compressing the springs 155 as the knife 146 is moved by the bar 145 to shear the webs which are fed across the base plate 142. As the cutting stroke of the knife 146 continues, the pins 148 come into engagement with a supporting plate 157 which is mounted on a plurality of pins 158 that are slidably mounted in the base plate 142. The pins 158 have coiled springs 159 thereon which normally hold the plate 157 in its raised position. The base plate 142 has a rib 160 thereon through which the pins 158 extend.

The bar 145 is adapted to be operated by the cams 89 and 90. A shaft 161 is mounted in the standards 77, 78 and 79. Adjacent the standard 77 the shaft 161 has an arm 162 pivoted thereon. This arm carries a roller 163 which engages the cam 89. At its free end, the arm 162 supports a rod 164 which extends through a slot 165 in the standard 77. Outside the standard 77 the rod 164, which is rotatably mounted in the arm 162, connects with a rod 166 which is secured to one end of the bar 145.

Adjacent to the standard 78, the shaft 161 has a lever arm 167 pivoted thereon. This lever arm carries a roller 168 which is adapted to engage the cam 90. The rod 164 extends through the lever arm 167 and through a slot 169 provided in the standard 78. A rod 170 connects the rod 164 with the end of the bar 145, as shown best in Figs. 3 and 4. The rod 164 is normally held in raised position by two springs 171 and 172 which are hooked over the rod 164 and which are connected by two turn buckles 173 and 174 to the base plate 142. When the cams 89 and 90 engage the rollers 163 and 168 with their extended portions, they push the levers 162 and 167 downwardly so as to move the rod 164 downward against the tension of the springs 171 and 172. This lowers the cutter bar 145 so as to cause the knife 146 to cut the overlapped webs which are fed across the plate 142.

The lever 162 also operates the adhesive applying mechanism by reciprocating the bar 72 (see Figs. 6 and 11–13). The lever 162 has an arm 175 secured thereto and extending upwardly therefrom. This arm has an elongated slot 176 at its upper end. The bar 72 is secured to the arm 175 by a pin 177 which extends through the slot 176. The bar 72 is made of two sections 72a and 72b, as shown in Fig. 6, these sections being overlapped and held by two collars 178

and 179, which are fastened by two screws 180 and 181. It is thus possible whenever desired to adjust the length of the bar 72.

The shaft 88 is adapted, through the eccentric 91, to actuate the suction device 81. The eccentric 91 engages a roller 182 (see Fig. 5), the roller being mounted upon an arm 183 which is formed on a lever 184. The lever 184 is rotatably mounted on the shaft 161. At its upper end, the lever 184 has a piston rod 185 pivoted thereto. The piston rod 185 carries a piston 186 which operates in an air cylinder 187. The air cylinder 187 is carried by the standard 79. An inlet pipe 188 for the cylinder 187 is connected by a flexible air hose 189 to the suction device 81.

An exhaust valve 190 is provided for the normal exhaustion of the cylinder 187 as the piston moves toward the closed end of the cylinder. An additional valve 191 is provided for admitting air to the cylinder to break the suction suddenly in the conduit 189 at the proper time. The valve 191 is carried by an arm 192 which is pivotally supported by a bracket 193 that is mounted on the standard 79. The free end of the lever arm 192 supports a link 194 which has an elongated slot 195 in the end thereof remote from the arm 192. The arm 192 and the link 194 are loosely connected by means of spaced collars 196 and 197 on the link 194, the link, of course, being extended through an opening in the arm 192. The link 194 is secured to the lever 184 by a headed pin 198 which extends through the slot 195. The lost motion provided by the slot 195 allows the lever 184 to draw the piston 186 rearwardly far enough to actuate the suction device 81, but just before the lever 184 reaches its limiting position, shown in dotted lines in Fig. 5, the pin 198 engages the outer end of the slot 195 so as to pull the link 194 to the left and thus open the valve 191 and release the suction in the conduit 189. The lever 184 and the pin 198 also actuate an arm 199 which is fixed on a rod 200 by a pin 201. A spring 199a tends to pull the arm 199 into the position shown in full lines in Fig. 5. The pin 198 engages the arm 199 near the end of the suction stroke of the lever 184 and moves the arm 199 to the dotted line position shown in Fig. 5. The rod 200 extends lengthwise of the machine and is supported by suitable lugs 202 provided on the standards 77 and 78. Two links 203 and 204 are fixed on the rod 200 and at their upper ends are connected to horizontally running levers 205 and 206. The levers 205 and 206 are slidably supported by upstanding posts 207 and 208 which are provided on the standards 78 and 77 respectively.

The levers 205 and 206 carry the suction device 81. The suction device 81 comprises two pipes 209 and 210 which are connected together at the center by connecting piping 211 which also is connected to the flexible conduit 189. The pipes 209 and 210 carry a plurality of suction nozzles 212 (see Fig. 3) each of which is provided with a valve 213. The nozzles have rubber tips 214 which are adapted to engage the overlapped webs and slide them off of the plate 142 onto a conveyer 215 (see Fig. 4).

Means are provided to adjust the frame 26 toward and away from the web advancing means 75 and 76 to accommodate the apparatus to the making of different widths of unit strips. It is necessary that the distance from the adhesive applying means to the shearing means be a multiple of the distance the overlapped webs are advanced each step in order to have the adhesive on the overlapped webs occur at the proper place on the unit strips.

The frame adjusting means includes a U-shaped framework 216 which is adapted to receive the brackets 26a and 26b on the front of the frame 26. The frame 216 and the brackets 26a and 26b have openings therein to receive two pins 217 and 218. The frame 216 has side portions 219 and 220 which are adjustably secured to the standards 77 and 78 and which may be moved together to move the frame 26 to and from the standards 77 and 78. A shaft 221 extends between the standards 77 and 78 and is journalled in bearings 222 provided on the standards 77, 78 and 79. A screw threaded shaft 223 (see Fig. 6) is journalled in the standard 77. It has a worm gear 224 thereon meshing with a worm 225 on the shaft 221. Also, a screw threaded shaft 226 is journalled in the standard 78. It carries a worm gear 227 which meshes with a worm 228 on the shaft 221. The side portions 219 and 220 are connected to two screw threaded blocks 229 (see Fig. 18) which receive the screw threaded shafts 223 and 226. The shaft 221 has a hand wheel 230 thereon. The frame 26 is adjusted with respect to the web advancing means by turning the hand wheel 230 and thereby rotating the shafts 223 and 226 to move the blocks 229 endwise of said shafts.

The general operation of the apparatus which has been described comprises the loading of the frame 26 with necessary spools of paper, the setting of these spools so as to give the proper overlapping of the webs as they are brought together, the application of the securing means (adhesive) to the webs, the bringing of the several webs into overlapped engagement with each other, the cutting of the overlapped webs, and the removal of the unit strips cut from the webs.

It will be appreciated that as many webs as desired up to the capacity of the apparatus may be fed to the adhesive applying means. If some of the adhesive applying devices are not to be used, they may be removed from their supports. All of them are easily removed for cleaning, filling, etc. It is also possible to use the apparatus to make several unit strips at the same time where each strip contains only a fraction of the total possible number of sheets. This is accomplished by removing certain intermediate adhesive applying devices. The web width and the overlap of one sheet with respect to another may be different in one set of unit strips to that in another set made at the same time. However, the several sets made at one time will have the same width because all of the webs are advanced the same amount.

It is desirable to have two frames 26 for each of the sets of advancing means 75 and 76. One frame is loaded with spools and adhesive material while the other is in the process of making unit strips. For the maximum capacity of the machine shown there should be four frames 26 and two sets of advancing means 75 and 76. The one shear and the one suction device can take care of the webs advanced.

It will be noted that the parts are arranged so that the adhesive is applied while the webs are stationary. Thus there is a clean cut row of small dots or areas of adhesive between each pair of adjacent sheets in a unit strip. The advancing means 75 and 76 have their cross bars oppositely disposed and close together so that the several

webs are well pressed together. The several webs are firmly held against slipping until they reach the shear. Even on both sides of the shear the sheets and webs are engaged and held together as the cutting takes place.

While the preferred embodiment of the invention has been shown, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement of the parts may be made without departing from the spirit and scope of the invention as described in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as possible, in view of the prior art.

I claim:

1. Apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising a plurality of web carrying spools, web feeding means, guides adapted to direct the webs from said spools into face to face overlapping engagement, means to apply a securing means to the several webs at uniformly spaced intervals lengthwise of the webs, and cutting means operable on said webs when in engagement to cut the overlapped webs along transversely running lines adjacent to said securing means.

2. Apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising a plurality of web carrying spools, web feeding means, guides adapted to direct the webs from said spools into face to face overlapping engagement, adhesive applying means operable to apply adhesive along lines extending transversely of the webs at uniformly spaced intervals along the webs, and cutting means operable to cut the overlapped webs into units of equal length.

3. Apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising web supporting and guiding means adapted to direct a plurality of webs into face to face overlapping engagement with a portion of each web exposed along one side edge thereof, web feeding means engaging the overlapped webs and operable to advance them together, means to apply adhesive in transversely running lines between said webs at longitudinally spaced points before they are brought into engagement, and means to cut the overlapped webs along transversely running lines adjacent to the lines of said adhesive.

4. In apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, web advancing means, a cutting device adapted to cut the web into sheets of the desired size, and adhesive applying means operable to apply adhesive material to said web along lines extending transversely of the web at longitudinally spaced points thereon.

5. In apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, web advancing means, a cutting device adapted to cut the web into sheets of the desired size, and adhesive applying means operable to apply adhesive material to said web in transversely extending rows of small areas at uniformly spaced distances lengthwise of the web.

6. In apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, web advancing means, a cutting device adapted to cut the web into sheets of the desired size, and adhesive applying means operable to apply adhesive material to said web at longitudinally spaced points thereon, said adhesive applying means comprising a row of adhesive carrying fingers arranged transversely across the path of the web.

7. In apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, adhesive applying means operable to apply adhesive material between the several sheets of a group in a row of small areas extending across the sheets, said adhesive applying means comprising a row of adhesive carrying fingers movable relatively to said sheets.

8. In apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, web advancing means, a cutting device adapted to cut the web into sheets of the desired size, and adhesive applying means operable to apply adhesive material to said web at longitudinally spaced points thereon, said adhesive applying means comprising an adhesive container and a plurality of elements spaced across the path of the web, for carrying adhesive from said container to said web.

9. A method of producing unit strips comprising a plurality of sheets overlapped and secured together so that a portion of each sheet adjacent to one edge is exposed to receive a legend, said method comprising the application of spaced small areas of adhesive material to one side of the sheets, and thereafter laying the sheets together with the sheets substantially aligned in one direction and overlapped in a direction at right angles to said first named direction so as to leave a portion of each sheet exposed.

10. A method of producing unit strips comprising a plurality of sheets overlapped and secured so that a portion of each sheet adjacent to one edge is exposed to receive a legend, said method comprising the laying of the sheets together one upon another and overlapping them so as to leave a portion along one edge of each sheet projecting beyond the next adjacent sheet on one side of it, and securing the said sheets in alignment as to an edge thereof extending in the direction of overlapping by applying securing means at spaced intervals along said last named edge.

11. A method of producing unit strips comprising a plurality of sheets overlapped and secured together so that a portion of each sheet adjacent to one edge is exposed to receive a legend, said method comprising the laying of the sheets together one upon another and overlapping them so as to leave a portion along one edge of each sheet projecting beyond the next adjacent sheet on one side of it, and securing the said sheets in alignment as to an edge thereof extending in the direction of overlapping by applying adhesive between adjacent sheets at spaced intervals along said last named edge.

12. A method of producing unit strips comprising a plurality of sheets overlapped and secured together so that a portion of each sheet adjacent to one edge is exposed to receive a legend, said method comprising the laying of a plurality

of webs of sheet material one upon another and overlapping them so as to leave a portion of each web alongside one longitudinal edge thereof projecting beyond the next adjacent web on one side of it, applying securing means to the webs at uniformly longitudinally spaced points, and cutting the several overlapped webs transversely between the points where they are secured together.

13. A method of producing unit strips comprising a plurality of sheets overlapped and secured together so that a portion of each sheet adjacent to one edge is exposed to receive a legend, said method comprising the laying of a plurality of webs of sheet material one upon another and overlapping them so as to leave a portion of each web alongside one longitudinal edge thereof projecting beyond the next adjacent web on one side of it, applying adhesive between the webs at longitudinally spaced points then pressing the webs together, and cutting the overlapped webs transversely between the points of application of adhesive into unit strips.

14. A method of producing unit strips comprising a plurality of sheets overlapped and secured together so that a portion of each sheet adjacent to one edge is exposed to receive a legend, said method comprising the laying of a plurality of webs of sheet material one upon another and overlapping them so as to leave a portion of each web alongside one longitudinal edge thereof projecting beyond the next adjacent web on one side of it, applying transversely running rows of adhesive material to one of each of the meeting faces of said webs at longitudinally spaced points, and cutting the webs transversely between said rows of adhesive material.

15. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, web supporting and guiding means operable to direct a plurality of webs into overlapping engagement with each other with a portion of each web along one side edge thereof exposed, web advancing means, means operable to attach the webs to each other at longitudinally spaced points thereof, cutting means operable to cut the overlapped webs transversely between the points of attachment, and means to adjust the web attaching means toward and away from the cutting means.

16. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, and cutting means operable to cut the overlapped webs into unit strips.

17. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, and cutting means operable to cut the overlapped webs into unit strips, said apparatus including means to attach together the several web portions in a unit strip.

18. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, and cutting means operable to cut the overlapped webs into unit strips, said web advancing means comprising two conveyors having opposed cross rods gripping the overlapped webs between them.

19. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, cutting means operable to cut the overlapped webs into unit strips, said web advancing means comprising two conveyors having opposed cross rods gripping the overlapped webs between them, and drive means operable to move said conveyors step by step.

20. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, and cutting means operable to cut the overlapped webs into unit strips, said web advancing means comprising two conveyors having opposed cross rods gripping the overlapped webs between them, guide means for said conveyors operable to direct the opposed cross rods gradually toward each other at the web receiving end of said conveyors.

21. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, and cutting means operable to cut the overlapped webs into unit strips, said web advancing means comprising two conveyors having opposed cross rods gripping the overlapped webs between them, said cross rods having resilient coverings.

22. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, cutting means operable to cut the overlapped webs into unit strips, said apparatus including means to attach together the several web portions in a unit strip, and suction operated means to remove the unit strips from the cutting means.

23. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, and cutting means operable to cut the overlapped webs into unit strips, said apparatus including means to attach together the several web portions in a unit strip, said web attaching means comprising adhesive applying devices carried by said frame and interposed between the paths of the webs.

24. In apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, web advancing means, a cutting device adapted to cut the web into sheets of the desired size, adhesive applying means operable to apply adhesive material to said web at longitudinally spaced points thereon, said adhesive applying means comprising a row of adhesive carrying fingers arranged transversely across the path of the web, said web advancing means comprising two conveyors having opposed cross rods gripping the overlapped webs between them, and actuating means for said adhesive applying means and said conveyors, operable to alternate the movements of the adhesive applying means with the conveyor movements.

25. In apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, web advancing means, a cutting device adapted to cut the web into sheets of the desired size, adhesive applying means operable to apply adhesive material to said web at longitudinally spaced points thereon, said adhesive applying means comprising a row of adhesive carrying fingers arranged transversely across the path of the web, and a common actuating means for said web advancing means and said adhesive applying means operable to alternately advance the webs and actuate the adhesive applying means.

26. Apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising web supporting and guiding means adapted to direct a plurality of webs into face to face overlapping engagement with a portion of each web exposed along one side edge thereof, web feeding means engaging the overlapped webs and operable to advance them together, means to apply adhesive between said webs at longitudinally spaced points, means to cut the overlapped webs along transversely running lines adjacent to the points of applying said adhesive, said cutting means including a reciprocating knife, and holding devices on opposite sides of the knife movable into engagement with the web to be cut as the knife advances, whereby to hold the web portions during the cutting thereof.

27. In apparatus for forming and assembling sheets in groups so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, web advancing means, a cutting device adapted to cut the web into sheets of the desired size, adhesive applying means operable to apply adhesive material to said web at longitudinally spaced points thereon, said adhesive applying means comprising a row of adhesive carrying fingers arranged transversely across the path of the web, and manually operable means for adjusting the distance of web travel from the fingers to the cutting device.

28. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, adhesive applying devices on said frame comprising adhesive containers adjacent to the web guiding means and between the paths of the webs, web engaging members therein adapted to transfer adhesive from the containers to the web, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, and cutting means operable to cut the overlapped webs into unit strips.

29. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, adhesive applying devices on said frame comprising adhesive containers adjacent to the web guiding means, web engaging members therein adapted to transfer adhesive from the containers to the web, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, and cutting means operable to cut the overlapped webs into unit strips, said adhesive containers being individually removable.

30. Apparatus of the character described adapted to produce units of sheets wherein each sheet is overlapped with respect to the adjacent sheets so that a portion of each sheet adjacent to one edge thereof is exposed to receive a legend, said apparatus comprising, in combination, a frame, web supporting and guiding means on said frame operable to direct a plurality of webs into overlapping engagement with each other, adhesive applying devices on said frame comprising adhesive containers adjacent to the web guiding means, web engaging members therein adapted to transfer adhesive from the containers to the web, a web advancing means adapted to receive the overlapped webs and draw them from said first named means, cutting means operable to cut the

overlapped webs into unit strips, said apparatus including an actuating device common to all said web engaging members for periodically causing them to transfer adhesive from the containers to the webs, and said web engaging members being individually releasable from the actuating device.

31. In apparatus for forming and assembling sheets in groups wherein each sheet is attached to adjacent sheets, web supporting and guiding means operable to direct a plurality of spaced webs into face to face engagement with each other, means to apply adhesive between the webs before they engage each other, said guiding means including elements operable to press the several webs tightly together, means to advance the several engaged webs as a unit, and cutting means operable to cut the engaged webs into groups of sheets, said adhesive applying means being arranged in a circular path about the point of face to face engagement of said webs as a center.

32. In apparatus for forming and assembling sheets in groups wherein each sheet is attached to adjacent sheets, web supporting and guiding means operable to direct a plurality of spaced webs into face to face engagement with each other, means to apply adhesive to one of each pair of engaging faces of the webs before they engage each other, said guiding means including elements operable to press the several webs tightly together, means to advance the several engaged webs as a unit, cutting means operable to cut the engaged webs into groups of sheets, said adhesive applying means comprising adhesive carrying fingers arranged transversely across the paths of the webs and arranged in a circular path, and said elements being substantially at the center of said path.

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