March 31, 1942. R. F. MORRISON 2,277,924

SHEET ASSEMBLING APPARATUS

Filed Jan. 15, 1940 7 Sheets-Sheet 1

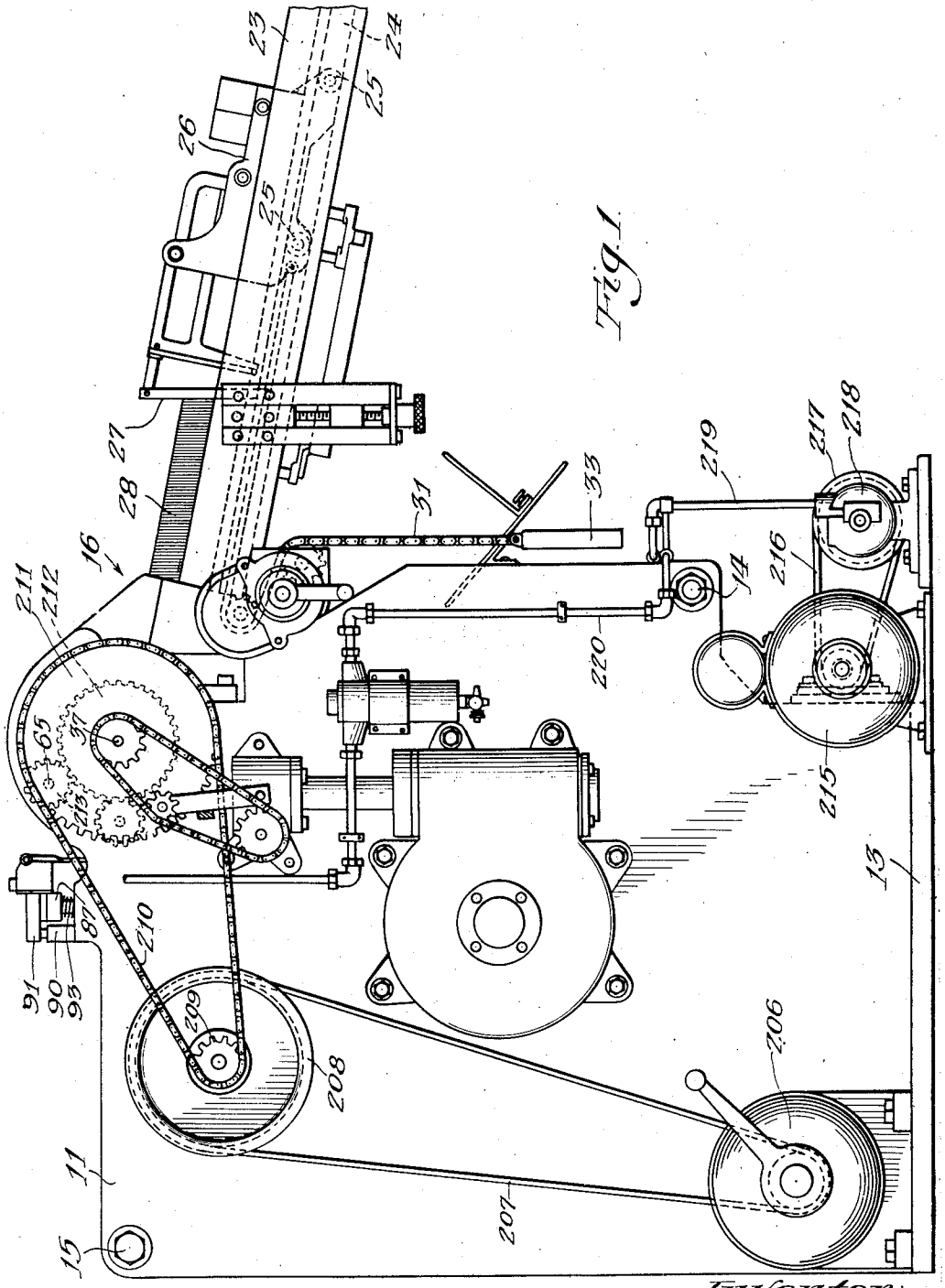


Fig. 1.

Inventor:
Robert F. Morrison
By Fidel, Carlson, Critzbaugh & Wells
Attorneys.

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SHEET ASSEMBLING APPARATUS

Filed Jan. 15, 1940 7 Sheets-Sheet 2

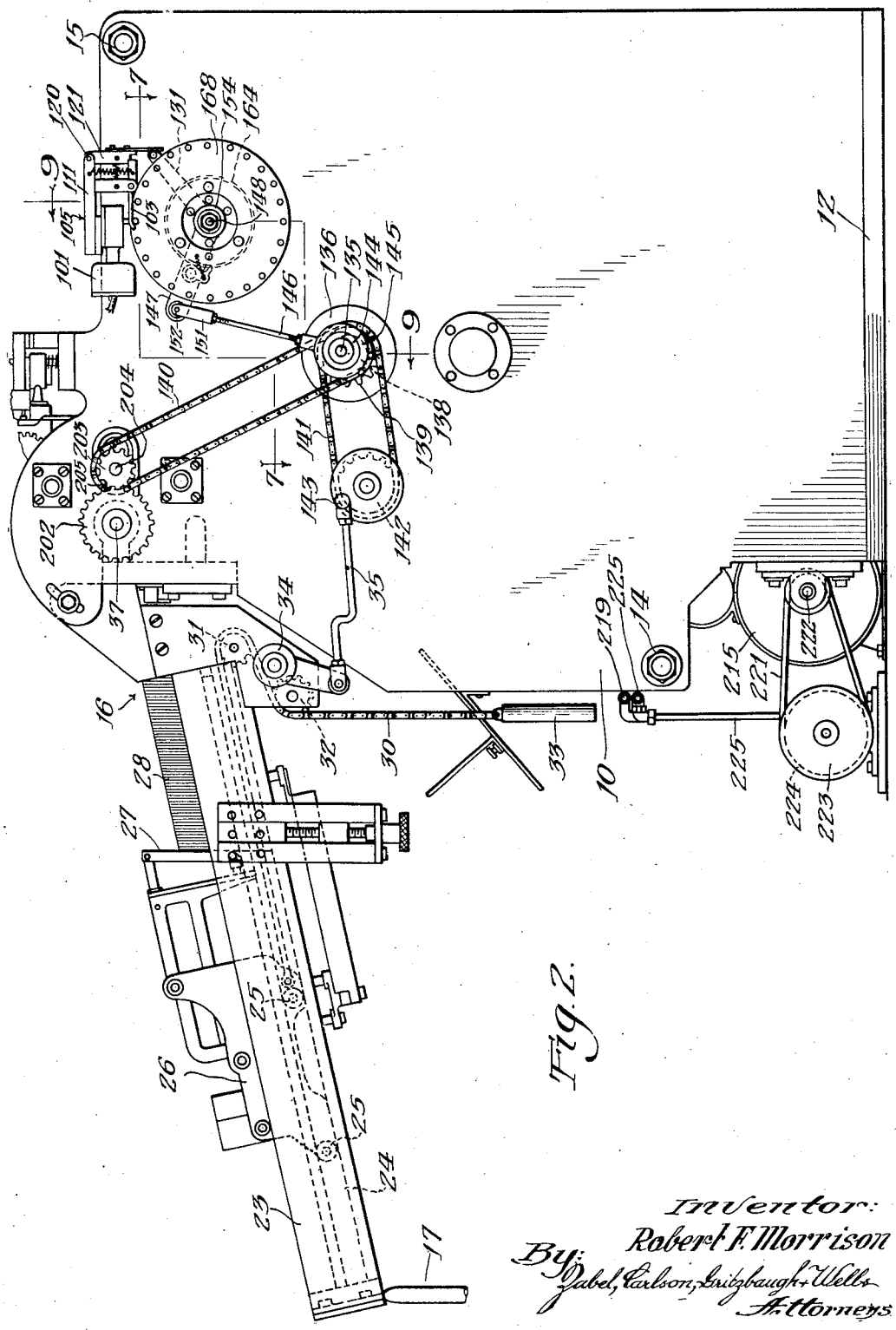


Fig. 2.

Inventor:
Robert F. Morrison
By Dabel, Carlson, Gritzbaugh & Wells
Attorneys

March 31, 1942. R. F. MORRISON 2,277,924

SHEET ASSEMBLING APPARATUS

Filed Jan. 15, 1940 7 Sheets-Sheet 3

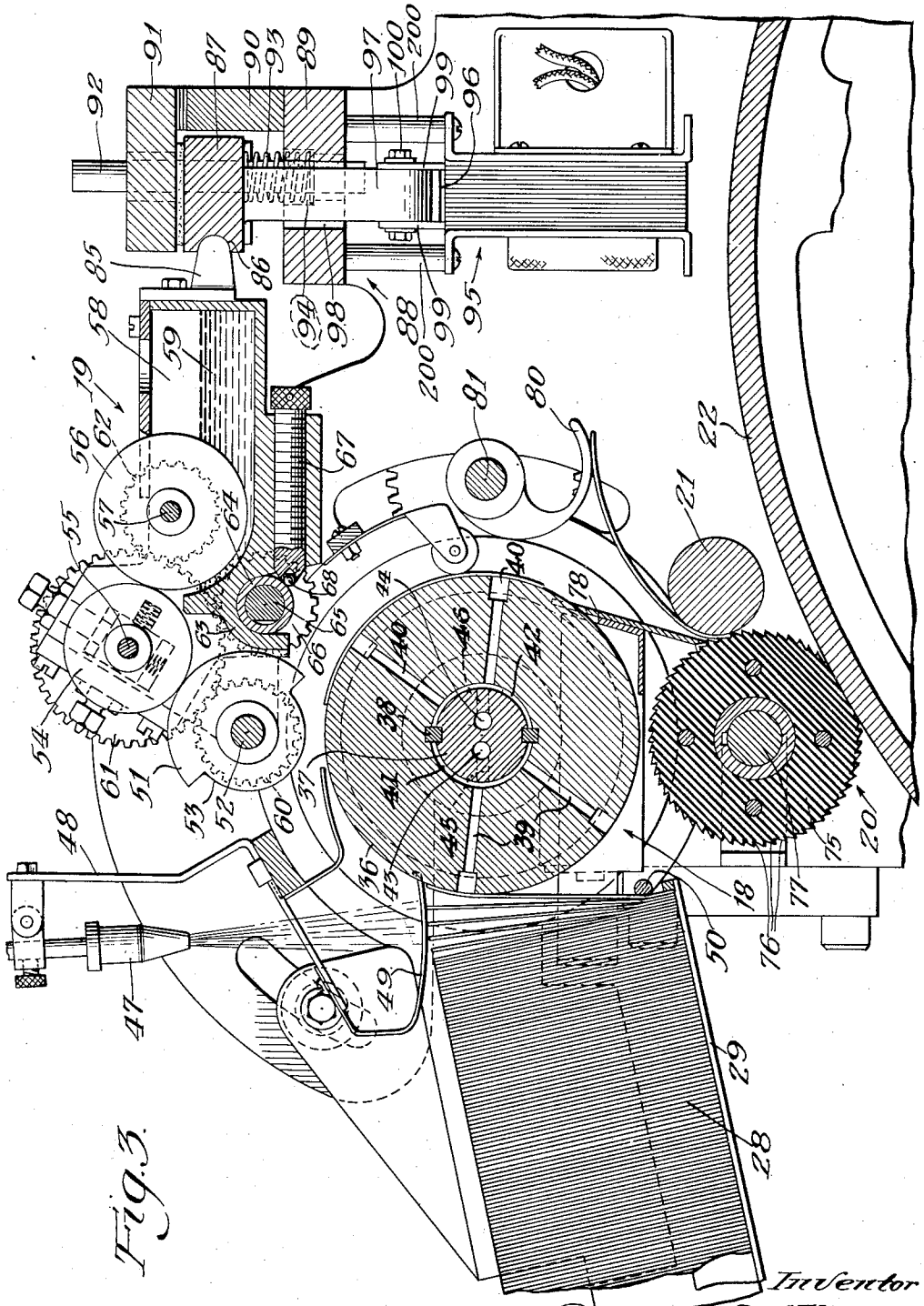


Fig. 3.

Inventor
Robert F. Morrison
By Jabel, Carlson, Quigbaugh & Wells
Attorneys

March 31, 1942. R. F. MORRISON 2,277,924

SHEET ASSEMBLING APPARATUS

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Fig. 4.

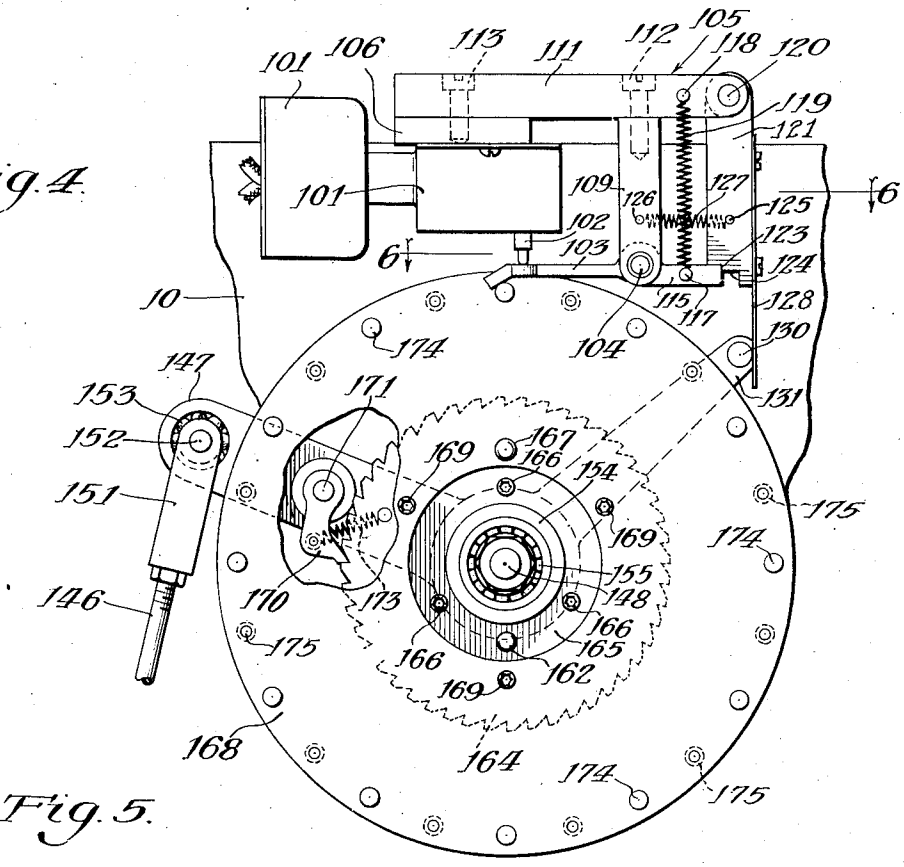


Fig. 5.

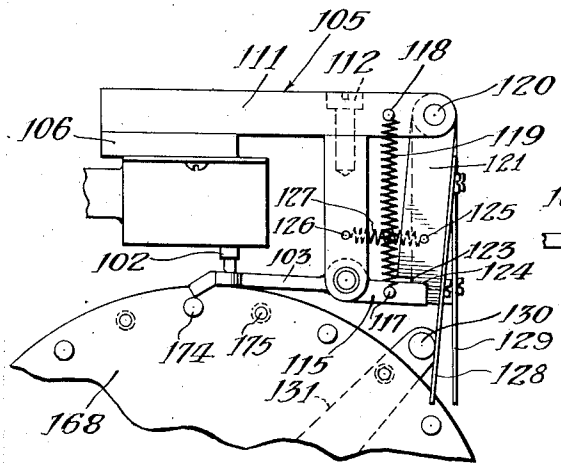
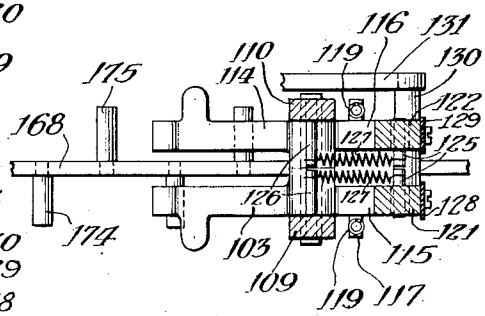


Fig. 6.



Inventor:
Robert F. Morrison
By Zabel, Carlson, Gribzbaugh & Wells
Attorneys.

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SHEET ASSEMBLING APPARATUS

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Fig. 7

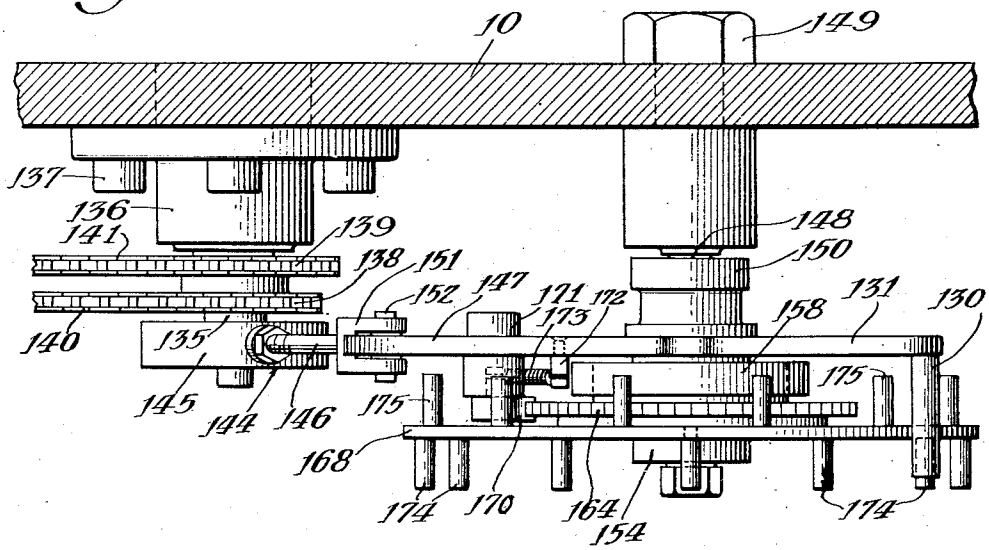
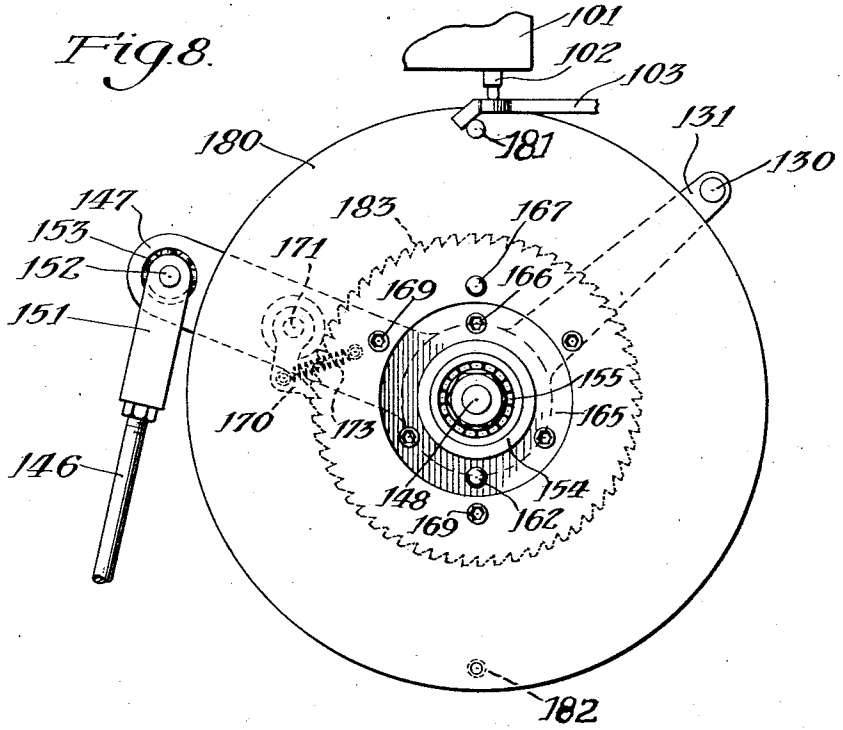


Fig. 8.



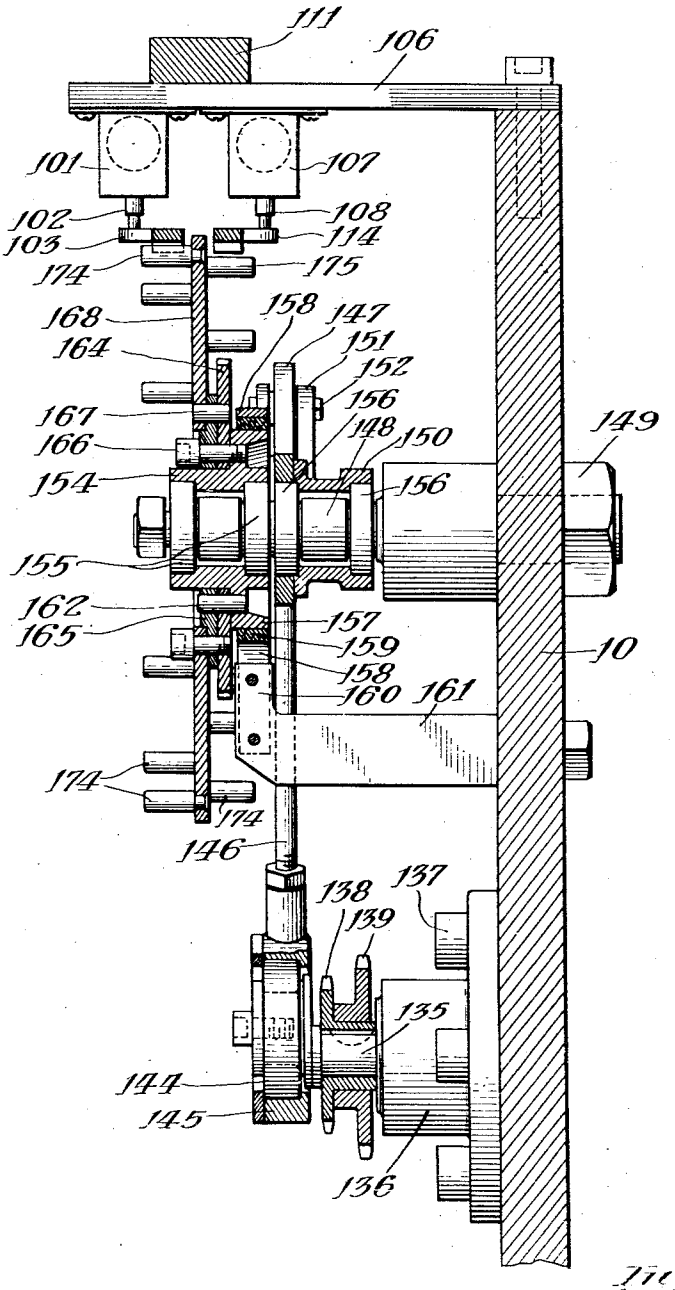
Inventor:
Robert F. Morrison
By: Fabel, Carlson, Gritzbaugh & Wells
Attorneys

March 31, 1942. R. F. MORRISON 2,277,924

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Fig. 9.



Inventor:
Robert F. Morrison
By Zabel, Carlson, Brizbuugh & Wells,
Attorneys.

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SHEET ASSEMBLING APPARATUS

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Fig. 10.

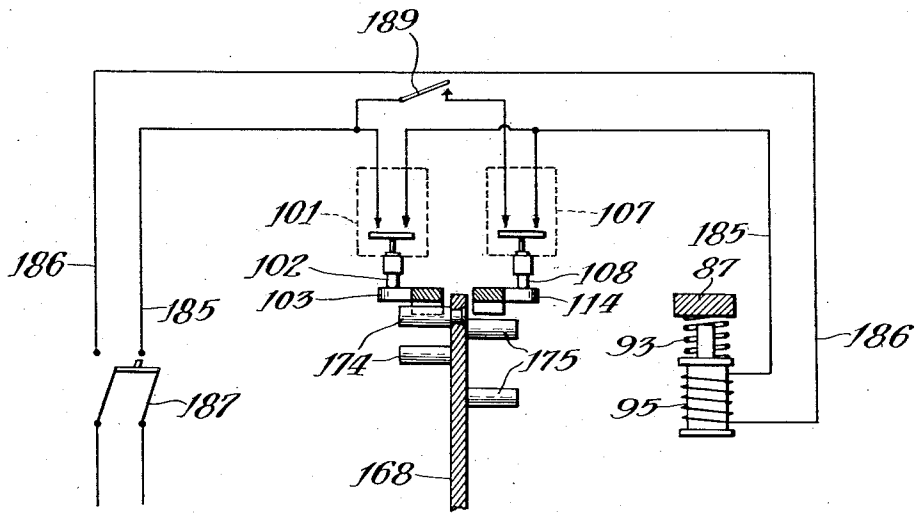


Fig. 11.

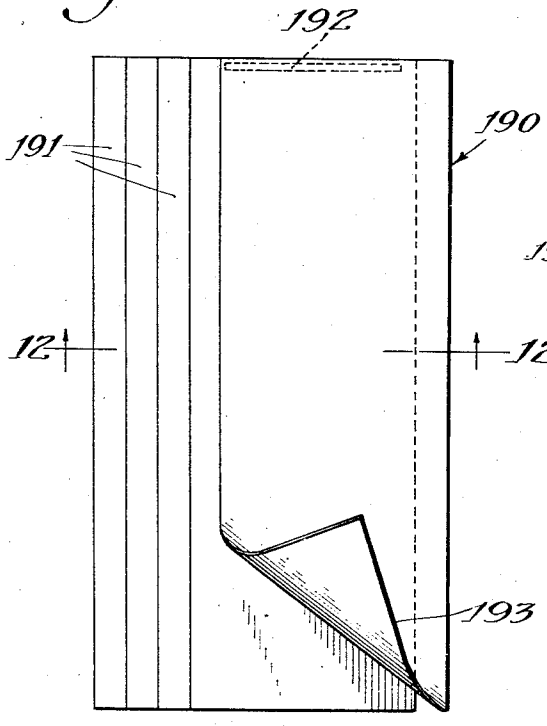


Fig. 12.



Inventor:
Robert F. Morrison
By: Zabel, Carlson, Brizbaugh & Wells
Attorneys

Patented Mar. 31, 1942 2,277,924

UNITED STATES PATENT OFFICE

2,277,924

SHEET ASSEMBLING APPARATUS

Robert F. Morrison, Oak Park, Ill., assignor to Ditto, Incorporated, Chicago, Ill., a corporation of West Virginia

Application January 15, 1940, Serial No. 313,978

17 Claims. (Cl. 93—1)

The present invention relates to sheet assembling devices, and more particularly to means for controlling the number of sheets in each assembly. My invention is particularly adapted for use in connection with that type of sheet assembling device wherein, as each sheet is fed into face to face relationship with an adjacent sheet, it is secured at one edge to the immediately preceding sheet. The controlling means comprises generally a timing device adapted to actuate suitable mechanism whereby the sheet securing operation is omitted at predetermined intervals with the result that an assembly otherwise having an indefinitely great number of sheets is broken up into a plurality of assemblies each having a predetermined number of sheets.

An object of this invention is to provide, for a sheet assembling device, controlling means whereby the number of sheets in each assembly may be predetermined.

A further object of the invention is to provide means for assembling sheets in face to face relationship in groups containing any predetermined number of sheets.

A preferred embodiment of my invention is herein shown and described as applied to a sheet assembling device of the type shown in the pending application of Patrick Henry Roethe, Serial No. 288,152, filed August 3, 1939, wherein the sheets are secured to one another by means of an adhesive substance. The mechanism shown is adapted to assemble sheets in groups so that a portion of each sheet adjacent to one edge is exposed to receive the legend, the remainder of the surface of each sheet, except the top sheet, being covered.

However, it is understood that my invention is not limited to this particular type of machine shown. For instance, it may be equally well applied to a machine for assembling sheets in the form of a booklet, that is, wherein the sheets are not offset from one another. My invention may also be used in connection with a machine wherein the sheets are secured to one another by means other than the adhesive securing means herein shown.

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 embodying the present invention;

Fig. 2 is a view in side elevation of the machine showing the side opposite from that shown in Fig. 1;

Fig. 3 is an enlarged sectional view taken through the upper part of the machine shown in Figs. 1 and 2;

Fig. 4 is a fragmentary enlarged elevation of a portion of the machine;

Fig. 5 is a fragmentary enlarged elevation similar to Fig. 4, but showing the parts in a changed position;

Fig. 6 is a section taken along line 6—6 of Fig. 4;

Fig. 7 is a section taken along line 7—7 of Fig. 2;

Fig. 8 is a fragmentary enlarged elevation similar to the view shown in Fig. 4 except for the fact that certain interchangeable parts have been substituted for the corresponding parts shown in Fig. 4;

Fig. 9 is a section taken along line 9—9 of Fig. 2;

Fig. 10 is a wiring diagram of the controlling device;

Fig. 11 is a plan view illustrating a group of sheets arranged in overlapping relation, and

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

Referring now in detail to the drawings, the present invention is embodied in a machine of the type described wherein the numerals 10 and 11 indicate two frames which support the several operating elements of the machine. The side frames 10 and 11 have bases 12 and 13 which are adapted to be mounted upon any suitable support. The side frames 10 and 11 are connected together by a plurality of cross tie rods such as those indicated at 14 and 15 in Figs. 1 and 2.

The machine comprises a sheet stack holding and advancing mechanism 16, one end of which is supported by the side frames 10 and 11 and the other end of which is supported by a suitable standard 17. The machine also comprises a sheet transfer device 18 which is rotatably mounted in the side frames 10 and 11. A device for applying means to attach one sheet to another is illustrated generally by the numeral 19 and comprises an adhesive applying mechanism. A spacing device 20 is arranged properly to space the sheets as they leave the transfer device 18 so that they overlap the desired amount. The overlapped sheets are then pressed together by a roller 21 and a drum 22, which successively engage the surface of the spacing device 20. The details of the operating mechanism for the devices hereinbefore mentioned are fully set forth

in the above mentioned co-pending application. Only a general description of the elements above mentioned, to show their relation to the controlling device, is set forth herein.

The sheet feeding device 16 comprises the side frames 23 which have a track in the form of a groove 24 formed therein. A carriage 26 is provided with rollers 25 which cooperate with the groove 24 so that the carriage may freely move with relation to the side frames. A pressure plate 27 is suitably mounted on the carriage. A stack of paper is indicated at 28, which stack rests on suitable guides 29, as shown in Fig. 3. A sprocket chain 30 is secured to the carriage and extends over sprockets 31 and 32 and thence downwardly. A counter-balancing weight 33 is secured to the lower end of the sprocket chain. A suitable driving mechanism for the sprocket chain is indicated at 34, and a link 35 is associated with the driving mechanism 34 for the actuation thereof. The position of the carriage is controlled by the driving mechanism 34.

The sheet transfer device 18, as shown in Fig. 3, comprises a plurality of rotatable elements 36, which are in the form of sectional drums. Fig. 3 is a section taken through one of the drums or rotatable elements which is shown mounted on a shaft 37 and secured thereto by means of keys 38. A pair of passageways 39 extends outwardly from the center of drum 36 to the periphery, and a corresponding pair of passageways 40 are oppositely disposed to the passageways 39. Semi-annular passageways 41 and 42 are formed between the shaft and the inner cylindrical surface of the drum, these passageways being in communication with the pasageways 39 and 40 respectively. The shaft 37 is drilled to provide longitudinal passages 43 and 44 therein. A suitable transverse connecting passage 45 is formed in the shaft 37 to provide communication between the passage 43 and passageways 41 and 39; a similar transverse connecting passage 46 provides communication between the passage 44 and passageways 42 and 40.

Sheet separating means are provided which are in the form of one or more blower nozzles 47 suitably mounted on a bracket 48. A spring retaining member 49 is suitably mounted on the framework of the machine in such a manner that the lower portion thereof contacts the upper edges of the few sheets in the stack 28 which are positioned close to the sheet transfer means 18. A stop member 50 in the form of a transverse bar engages the lower portion of the end sheet of the stack 28.

It will be seen that the pressure plate 27 urges the stack against the stop member 50. The blower nozzle 47 is connected to a suitable source of high pressure and serves to separate the upper edges of the few end sheets of the stack substantially as shown in Fig. 3. The end sheet is blown over against the rotatable elements 36. The passages 43 and 44 are connected to a suitable source of subatmospheric pressure at predetermined intervals. For instance, in the position of the parts as shown in Fig. 3, the passage 43 is connected to said source and the suction draws the upper portion of the end sheet into contact with the rotatable element in such a manner that as this element 36 rotates, it will disengage the end sheet from the stack and from the stop member 50 and carry the sheet with it as it rotates. The spring retaining member 49 prevents incidental displacement or removal of the adjacent sheets while the end sheet is being removed from the stack. The spring retaining member 49 is sufficiently weak so that it will not prevent the end sheet from being carried upwardly when it is held to the surface of the drum by the suction means above mentioned.

It will be seen that two sheets are transferred or removed for each single rotation of the rotatable elements or sectional drums 36. The source of subatmospheric pressure may be disconnected from the respective passages 43 and 44 at suitable intervals to facilitate removal of the sheet from the rotatable elements at the proper time.

An adhesive applying roller 51 is shown in elevation in Fig. 3, this roller being of comparatively narrow width, inasmuch as it is desired to apply only a narrow strip of adhesive to each sheet. This roller is mounted on and secured to a shaft 52 and is provided with a cut-away portion of its periphery 53. An intermediate roller 54 contacts the roller 51, the intermediate roller being mounted on and secured to a shaft 55. A supply roller 56 is mounted on and secured to a shaft 57 in such a manner that one portion of the roller contacts the intermediate roller 54 and another portion extends into a container 58 and is immersed in an adhesive substance 59 which is located in the container.

The sides of the container may be extended to provide journals for mounting the shafts 52, 55 and 57. Gears 60, 61 and 62 are provided for each of the shafts 52, 55 and 57 respectively, these gears meshing with each other so that the rollers may be driven at the desired speed ratios. The container is provided with a saddle portion 63 which cooperates with a sleeve 64 which is secured to a drive shaft 65. A gear 66 is mounted on and secured to the shaft 65 and meshes with the gear 61 by means of which the three rollers are driven. A suitable retaining means such as the bolt 67 is mounted in the lower portion of the container, the bolt having a ball bearing 68 at one end which is adapted to contact the sleeve 64. The retaining means prevents removal of the container and associated parts which make up the adhesive applying means 19 from the drive shaft or the sleeve which pivotally supports the entire assembly. It will be seen that in its normal position, as shown in Fig. 3, each cycle of operation of the adhesive applying roller 51 includes an active and a passive phase, the active phase comprising that portion of the cycle wherein the roller contacts the sheet carried by the rotatable elements 36, and the passive phase being that portion of its cycle wherein the cut away portion 53 of the adhesive applying roller is opposite the rotatable elements 36. The cut away portion 53 and the passive phase are provided so that adhesive will not be applied to the surface of the rotatable element during those times at which a sheet of paper is not positioned directly beneath the adhesive applying roller 51. Furthermore, this construction is used so that a strip of adhesive of a predetermined length, which may be shorter than the length of the sheet, may be applied to the sheet.

The adhesive applying means 19 is pivotally mounted so that the means as a whole may be rendered inoperative by rotating it in clockwise direction from the position shown in Fig. 3. This rotation or tilting may occur during the passive phase of the cycle of operation so that the length of the strip of adhesive is not dependent upon closely timed operation of the tilting or rotating means, which will be hereinafter described.

The spacing means 20 comprises a suitable rubber roller 75 which may be in the form of a plurality of sectional rubber drums which are secured to a rotatable shaft 77. The roller 75 is provided with a plurality of teeth 76 on the periphery thereof. These teeth are adapted to position each sheet with respect to the adjacent sheets as they are fed from the rotatable elements 36 to the roller 75. A stripper or bar 78 is provided at its upper end with projections which extend between the rotatable elements 36 and serve to strip the sheet from the rotatable elements and to guide it downwardly to the bite formed by the rubber roller 75 and the pressure roller 21.

One or more rotary fingers 80 are mounted on and affixed to a shaft 81 which is suitably driven by the driving mechanism for the machine as a whole. The operation of these fingers is so timed that they will engage the upper end of the sheet at about the time the lower end is held between the roller 75 and the pressure roller 21. As shown in Fig. 3, after engagement of the sheet by the rotary fingers, the sheet is caused to be bent to the right so that the succeeding sheet may be fed to the bite between the rollers 75 and 21 where it is engaged by the next succeeding tooth of the roller 75. By this means the sheets are spaced from one another and arranged in the correct order.

The pressure roller 21 cooperates with the rubber roller 75 to press the assembly so that the sheets which have been previously provided with a strip of adhesive substance will adhere to each other. The sheets, as assembled, will be carried by the roller 75 downwardly into contact with the surface of the drum 22 against which the roller 75 presses and on the surface of which the assembly will be deposited.

A lug 85 is mounted at one end of the container 58, and is engaged by a groove 86 formed in a bar 87. The bar 87 is mounted in a frame work which comprises a lower plate 89, a vertical plate 90 and an upper plate 91 resting on the vertical plate and spaced thereby from the lower plate 89. The guide pins 92 are mounted in the lower and upper plates and extend through a suitable aperture in the bar 87 so that the bar may slide vertically between the upper and lower plates. A suitable recess 94 is formed in the upper surface of the lower plate 89, and a spring 93 is positioned within this recess and extends upwardly into contact with the bar 87 to urge the same against the upper plate 91. An electromagnet 95 is positioned beneath the framework 88 and is provided with a core 96. A lug 97 extends downwardly from the bar 87 through a suitable opening 98 and is connected with the core 96 by means of ears 99 formed on the core and a bolt 100 which extends through the ears and through the lug in the usual manner. The electromagnet is spaced from the framework by means of spacing members 200.

It will be seen that when the electromagnet is energized, the bar will be drawn downwardly against the compression of the spring 93, which, in turn, will cause the adhesive applying means 19 to be moved from the operative to the inoperative position. When the electromagnet is not energized, the adhesive applying device will remain in its operative position, substantially as shown in Fig. 3.

Switches 101 and 107, which may be connected in parallel with each other, control the operation of the electromagnet 95. These switches may be mounted on a cross bar 106, as shown in Figs. 4 and 9, this cross bar being suitably supported on the side frame 10 of the machine. The switches 101 and 107 are provided with downwardly extending buttons or switch actuating members 102 and 108 respectively, which, when they are displaced upwardly from the position shown in Fig. 4 to that shown in Fig. 5, will operate the switch to close the circuit to the electromagnet.

A framework 105, comprising a horizontal member 111 and vertical members 109 and 110 depending therefrom, is secured to the cross bar 106 by means of a stud 113. The vertical members may be secured to the horizontal member 111 by means of suitable studs 112. A stationary shaft 104 is carried at either end by the vertical members 109 and 110, and on this shaft is pivoted a lever 103, which cooperates with the switch actuating member 102 and a lever 114 for cooperation with the button 108. Each of the levers is provided with a bent end 201, as shown in Figs. 4 and 5. Each of the levers 103 and 114 is provided with a rear extension 115 and 116 respectively. A spring 119 is provided for each of the levers to bias them in a counterclockwise direction, as shown in Fig. 4, the spring being suitably mounted substantially as shown, wherein one end may be affixed to a pin 117 on the rear extension 115, and the other end affixed to a pin 118 mounted on the horizontal member 111. The spring for lever 114 may be similarly mounted.

The right-hand end of the horizontal member 111, as viewed in Fig. 4, may be forked and may carry a stationary shaft 120, from which shaft depend levers 121 and 122 which are pivotally mounted thereon. Each of these levers are provided with a stepped end surface at their lower extremity so as to provide a vertical face 123 and a horizontal face 124. The levers 121 and 122 are suitably biased in a clockwise direction, as viewed in Fig. 4, by means of a spring 127 which extends between a pin 125 mounted on lever 121 and pin 126 mounted on vertical member 109. The spring for lever 122 is similarly mounted.

Each of the levers 121 and 122 is provided with an extension 128 and 129 respectively, these extensions extending downwardly into the path of a pin 130 which is mounted on an oscillating arm 131.

It will be seen that upon displacement of either of the levers 103 and 114 against the bias of spring 119, that the lever 121 acts as a detent to hold the lever 103 in a displaced position until such time as the pin 130 on the oscillating arm 131 releases the detent. In its normal position, the vertical face 123 engages the end of the rear extension 115, but as soon as the lever 103 is rotated in a clockwise direction, the lever 121 will rotate under the action of spring 127 so that the horizontal face 124 will engage the rear extension 115 and maintain the lever 103 in its displaced position. This position of the parts is shown in Fig. 5. When either of the levers 103 or 114 is held in displaced position by the detent arrangement shown, they will be released at a predetermined time by the engagement of pin 130 with either of the extensions 128 or 129.

Reference now to Figs. 7 and 9 will disclose the mechanism for actuating the switches 101 and 107. A stub shaft 135 is suitably mounted in a journal 136, the journal being fixed by means of studs 137 to the side frame member 10. Sprockets 138 and 139 are keyed to the stub shaft 135. The stub shaft 135 is driven by means of

a sprocket chain 140, as shown in Fig. 2, which engages the sprocket 138, the sprocket chain 140 being driven by suitable means hereinafter described. A sprocket chain 141 connects the sprocket 139 with the sprocket 142, the latter sprocket having a crank pin 143 mounted thereon which is associated with the link 35. The reciprocating link 35 actuates the driving mechanism 34 for the carriage 26, as above mentioned. An eccentric 144 is suitably associated with the stub shaft 135, and a bearing 145 in the form of a sleeve or band is associated therewith. A connecting rod 146 is provided, its lower end being suitably connected to the bearing 145, and its upper end terminating in a yoke 151.

A stationary stub shaft 148 is suitably mounted on the side frame member 10 by means of a nut 149 in the usual manner. A hub 150 is rotatably mounted on the stub shaft 148 by means of ball bearings 156. The hub 150 has an arm portion 147 extending outwardly therefrom, the outer end thereof carrying a ball bearing 153. A pin 152 extends between the arms of the yoke 151 and also extends through the ball bearing 153 so that the hub 150 and the arm 147 may be oscillated by means of the connecting rod 146. It will be noted that the oscillating arm 131 is also mounted on the hub 150 so that the motion of this arm is controlled by reciprocation of the connecting rod 146.

A hub 154 is rotatably mounted on the stub shaft 148 by means of ball bearings 155. This hub carries a brake drum 157 which cooperates with a stationary brake band 158 which is mounted on a supporting lug 160. A bracket 161 is suitably affixed to the side frame member 10 and carries the lug 160 and the brake band 158. Friction material 159 may be secured to the brake band 158. The brake band is suitably tensioned so that, as the hub 154 and its associated parts are rotated intermittently, there will be no tendency for overthrow of the hub. If desired, other suitable means such as a locking device may be used to prevent overthrow of the hub.

A dowel 162 is mounted in the hub 154. A ratchet wheel 164 and a spacer 165 are mounted on the hub, these members being provided with suitable apertures by means of which they may be fitted over the dowel. Studs 166 are provided which extend through the spacer and the ratchet and are screw-threaded into the hub. A dowel 167 is positioned in the spacer 165 and extends at one end into the ratchet and at the other end into a disc 168. Studs 169 are provided which extend through the disc and the spacer and are screw-threaded into the ratchet.

It will be seen that the means by which the disc 168 and the ratchet 164 are secured to the hub permits of easy removal of these parts and substitution of other interchangeable discs and ratchets. The dowel 162 is provided to facilitate the assembling of the ratchet and the spacer with the hub, and the dowel 167 is provided to facilitate the assembling of the disc with the other parts of the hub assembly. It will be noted that the parts are so arranged that the disc may be interchanged without removing the ratchet or the spacer.

A pawl 170 is rotatably mounted on the arm 147, as shown in Fig. 4, for cooperation with the ratchet 164. The pawl is suitably affixed to the arm 147 by means of a pin 171, and is biased in a counter-clockwise direction by means of a spring 173 which extends from the pawl to a suitably located pin 172 on the arm 147.

A series of pins 174 is provided on one face of the disc 168, and a similar series of pins 175 may be provided on the opposite face of the disc.

A gear 202 is provided on the outer end of the shaft 37, and meshes with a gear 203 suitably mounted on a stub shaft 204. A sprocket 205 is also associated with the stub shaft 204 and engages the sprocket chain 140, these parts being shown in Fig. 2. Reference to Fig. 1 will indicate that a motor 206 drives the shaft 37 by suitable means, such as a belt 207 which drives the pulley 208, the pulley having a sprocket wheel 209 affixed to it. A sprocket chain 210 connects the sprocket 209 with a large sprocket wheel 211 which is mounted on shaft 37. It will be seen, consequently, that the stub shaft 135 and its associated eccentric are driven from the shaft 37 by means above described, in timed relationship with the operation of the other elements of the machine. The shaft 65 which drives the adhesive applying mechanism 19 is also driven from shaft 37 by means of a gear 212 which is mounted on the shaft 37 and drives a gear 213 mounted on shaft 65, as shown in Fig. 1. Therefore, the position of the eccentric 144, the connecting rod 146, and the arms 147 and 131 bear a definite relationship to the position of the adhesive applying roller 51. A pump motor 215 drives a pump 218, as shown in Fig. 1 by means of a belt 216 and a pulley 217 mounted on the shaft of the pump 218. A conduit 219 leads from the pump 218 and extends up one of the drilled passages in shaft 37. The conduit 220 connects the nozzles 47 with another pump which is not shown. A belt 221 connects the pulley 222 on the shaft of the motor 215 with the pulley 223 so that the pump may be operated. A conduit 225 extends from the pump 224 to the other drilled passage of the shaft 37.

As the arm 147 is oscillated by the connecting rod 146, the ratchet 164 will be advanced step by step in the counter-clockwise direction, as viewed in Fig. 4. The angular displacement of the ratchet 164 during each step is determined by the angular spacing of the ratchet teeth. Although the throw of the arm 147 is fixed, only during the latter portion of its oscillation it is effective to advance the ratchet; during the first portion, the pawl 170 rides idly on the preceding tooth without advancing the ratchet. At intervals which are determined by the number of teeth in the ratchet wheel and the number of pins in the disc 168, it will be seen that the lever 103 will be displaced upwardly by means of one of the pins 174, thereby causing the adhesive applying device to be rendered inoperative. Similarly, one of the pins 175 may displace the lever 114 to depress the switch actuating button 108 which will also render the adhesive applying device inoperative.

It will be noted that the ratchet 164, which is shown in Fig. 4, is provided with 48 teeth, and the disc 168 is provided with 24 equidistantly spaced pins, 12 being provided on each side of the disc. Reference to Fig. 8 shows a substituted ratchet and disc, the ratchet 183 being provided with 60 teeth, and the disc 180 being provided with 2 pins only, the pin 181 being on one side of the disc for cooperation with the lever 103, and the pin 182 being on the other side of the disc. The parts shown in Fig. 8 are arranged so that the adhesive applying device will be rendered inoperative once during every 30 cycles, whereas the parts shown in Fig. 4 are so arranged that the adhesive applying device is ren-

dered inoperative once in every 2 cycles, thus producing assemblies having 30 sheets and 2 sheets respectively.

Reference to Fig. 10 will indicate the arrangement of the electrical circuit which operates the electromagnet **95**. Reference numerals **185** and **186** represent conductors leading from the electromagnet **95** to a suitable source of power, a manual switch **187** being provided to disconnect the electromagnet. The switches **101** and **107** are in parallel with each other and are interposed along the conductor **185** so that actuation of either one of these switches will close the circuit to the electromagnet **95**. Energization of the electromagnet **95** will draw downwardly the bar **87** against the tension of spring **93**, thereby tilting the adhesive applying device **19** in the clockwise direction, as shown in Fig. 3, so that the roller 51 will not contact the sheet. A manually actuated switch **189** may be provided in series with the contacts **107** so that, when this switch is opened, the electromagnet **95** will be energized at periods determined by the number of pins on only one side of the disc **168**. Consequently, with the parts shown in Figs. 4 and 10, the sheet assembly device will be controlled to assemble sheets in groups of two when the switch **189** is closed; when this switch is opened, sheets will be assembled in groups of four.

In Figs. 11 and 12, one unit **190** of assembled sheets is shown as it appears when removed from the machine. The unit **190** is shown here as composed of five sheets overlapped so as to leave an exposed portion **191** on each of the sheets which is beneath the top sheet **193**. The several sheets are secured together at the side edge shown at the top of Fig. 11 by reason of a small strip **192** of adhesive material such as glue which was applied to each of the sheets with the exception of the top sheet **193**. The several sheets can be readily separated when it is desired to file them individually, yet the unit can be handled and passed through a printing or duplicating machine while the several sheets are together. Thus the exposed portions **191** of the sheets may be written or printed upon while the sheets are together, and the remainder of each sheet may then receive an individual message.

The operation of the machine is as above described in detail in connection with the various groups of parts. It will be seen that after the stack **28** of sheets is placed in the machine, and it is otherwise ready for operation, that the proper disc and the proper ratchet may be selected and secured to the hub **154** so that the sheets may be assembled in groups containing any predetermined number of sheets. The sheets are withdrawn one by one from the stack and adhesive is applied to each sheet by the adhesive applying device **19** as each sheet is transferred by the sheet transfer device **18** down to the spacing device **20**. The roller **21** and the drum **22** cooperate with the spacing device **20** to press the sheets into contact with each other so that their adhesive coating may hold them together. Whenever the circuit to the electromagnet **95** is closed, there will be no adhesive applied to the sheet then being transferred, and hence the number of sheets in each assembly may be determined.

It is essential that the circuit of the electromagnet be closed during the passive phase of the adhesive applying device, and that it be held closed continuously during the next succeeding active phase, and that it be again opened during the passive phase next succeeding the above mentioned active phase. This enables the adhesive to be omitted for one sheet without closely timing the action of the controlling means.

The detent arrangement is provided so that the circuit to the electromagnet may be held closed throughout the active phase of the adhesive applying device. It will be noted that the arrangement of the parts is such that the circuit is closed as soon as the disc begins to rotate, and the circuit remains closed during a part of the upward movement of the connecting rod **146** and throughout the entire downward stroke thereof. Consequently, the circuit is held closed through more than 180° of the cycle of rotation of the stub shaft **135**. The stub shaft **135** rotates in one to one relationship with the shaft **52**, and therefore the adhesive applying device may be rendered inoperative throughout its entire active phase.

Reference to Fig. 4 will indicate that the 48 tooth ratchet **164** may be combined with the disc **168**, having 24 pins, to produce assemblies having 2 strips, or combined with discs having 16, 12, 8, 6, 4, 3 or 2 pins to produce assemblies having 3, 4, 6, 8, 12, 16 or 24 strips, respectively. Similarly, reference to Figure 8 will indicate that the 60 tooth ratchet **183** may be combined with the disc **180**, having two pins, to produce assemblies having 30 strips, or combined with discs having 12, 6, 4 or 3 pins to produce assemblies having 5, 10, 15 or 20 strips, respectively. The disc **180** may also be combined with ratchets having 46, 48, 50, 52, 54, 56, 58 or 66 teeth to produce assemblies having 23, 24, 25, 26, 27, 28, 29 or 33 sheets, respectively.

The number of ratchets and discs which must be used in combination with each other to produce assemblies having any desired number of strips up to any given number, say from 2 to 34, may be considerably reduced by the provision of manual switch **189**.

It will be further noted that although various ratchets may be provided which have teeth which are separated in varying degree, that the distance between the teeth of the ratchet wheel having the greatest number of teeth must be more than one-half the angular distance between the adjacent teeth on the ratchet wheel having the smallest number of teeth. Otherwise, the ratchet wheel is likely to be advanced more than one tooth at a time.

While I prefer to employ the form and arrangement of parts as shown in my drawings and as above described, it is to be understood that my invention is not to be limited to such form and arrangement except so far as the claims may be so limited.

I claim:

1. Mechanism for counting the number of operations of a machine and for controlling the operation of said machine comprising a reciprocating pawl operable in timed relationship to said machine, a ratchet adapted to be advanced step by step by said pawl, a control member actuated by said ratchet upon advance by said ratchet through a predetermined number of steps, and means associated with said control member to maintain the same in actuated position for a predetermined length of time.

2. In a sheet assembly device, sheet securing means, and means for rendering said sheet securing means inoperative comprising a rotatable member adapted to be advanced step by step through a predetermined angular distance in

each step, control means associated with said rotatable member including a displaceable member adapted to be actuated by said rotatable member as it rotates through certain predetermined steps, retaining means for maintaining said displaceable member in displaced position, means for advancing said rotatable member in timed relationship with the operation of said sheet securing means, and means associated with said advancing means for causing the release of said retaining means, said displaceable member being associated with said sheet securing means to render the same inoperative when displaced.

3. In a sheet assembling device, sheet securing means, and means for rendering said sheet securing means inoperative comprising a rotatable member adapted to be advanced step by step through a predetermined angular distance in each step, control means associated with said rotatable member including a displaceable member adapted to be actuated by said rotatable member as it rotates through certain predetermined steps, retaining means for maintaining said displaceable member in displaced position, a pawl for advancing said rotatable member, means for oscillating said pawl in timed relationship with the operation of said sheet securing means, and means associated with said pawl for causing the release of said retaining means, said displaceable member being associated with said sheet securing means to render the same inoperative when displaced.

4. In a sheet assembling device, sheet securing means having a cycle of operation including an active and a passive phase, and means for rendering said sheet securing means inoperative during a portion of said cycle, comprising a displaceable control member, means to displace said displaceable control member during the passive phase of a predetermined cycle of operation of said sheet securing means, retaining means for maintaining said displaceable member in displaced position during the active phase next succeeding said passive phase, and means for the release of said retaining means during the passive phase next succeeding said active phase.

5. In a sheet assembling device, sheet securing means having a cycle of operation including an active and a passive phase, and means for rendering said sheet securing means inoperative during a portion of said cycle comprising a displaceable control member, means to displace said displaceable control member during the passive phase of a cycle of operation of said sheet securing means, retaining means for maintaining said displaceable member in displaced position during the active phase next succeeding said passive phase, means for the release of said retaining means during the passive phase next suceeding said active phase and means for selecting a cycle of operation during which said control member will be displaced.

6. Timing means for controlling the sheet securing means of a sheet assembling device comprising a series of interchangeable discs having equidistantly spaced projections thereon, a member rotatable in timed relationship with said sheet securing means, means for securing one of said discs to said rotatable member, and an arm extending into the path of said projections and adapted to be displaced thereby to control said sheet securing means.

7. Timing means for the sheet securing means of a sheet assembling device comprising a series of interchangeable ratchets, a rotatable member mounted on said sheet assembly device, a pawl associated with said sheet assembling device and operable in timed relationship with said sheet securing means, means for securing one of said ratchets to said rotatable member, displaceable means for controlling the operation of said sheet securing means, and means associated with said rotatable member for engaging said displaceable means at regular intervals.

8. Timing means for the sheet securing means of a sheet assembling device comprising a series of interchangeable ratchets, a rotatable member mounted on said sheet assembly device, a pawl associated with said sheet assembling device and operable in timed relationship with said sheet securing means, means for securing one of said ratchets to said rotatable member, displaceable means for controlling the operation of said sheet securing means, and means associated with said rotatable member for engaging said displaceable means at regular intervals, said latter means including a disc having equidistantly spaced projections thereon, said disc constituting one of a number of discs in each of which the equidistantly spaced projections are spaced from each other by a different amount.

9. Timing means for the sheet securing means of a sheet assembling device comprising an actuating member which oscillates through a given arc, a rotatable member adapted to be displaced step by step by said actuating member, and power means through which said actuating member drives said rotatable member comprising a part readily removable from position for enabling the easy substitution of an alternative part by which the timing of the operation of said rotatable member may be varied.

10. Timing means for sheet securing means of a sheet assembling device comprising an actuating member which oscillates through a given arc, a rotatable member adapted to be displaced step by step by the motion of said actuating member in one direction, a displaceable control member, and means associated with said rotatable member for displacing said control member to render said sheet securing means inoperative, a detent to hold said control member in displaced position, and means associated with said actuating member to cause release of said detent by the motion of said actuating member in the opposite direction.

11. Timing means for sheet securing means of a sheet assembling device comprising an actuating member which oscillates through a given arc, a pawl mounted on said actuating member, a rotatable member adapted to be displaced step by step by said pawl, a displaceable control member, means associated with said rotatable member for displacing said control member to render said sheet securing means inoperative, a detent to hold said control member in displaced position, means to cause release of said detent, said means extending into the path of said actuating member whereby said control member may return to normal position at a predetermined time during each cycle of operation of said actuating member.

12. A sheet assembling device comprising means to apply adhesive to separate sheets of paper, means to position said sheets in overlapping relationship, means for pressing said sheets against one another to cause them to adhere to each other, and means for rendering said adhesive applying means inoperative, said latter means including an electromagnet asso-

ciated with said adhesive applying means and adapted to displace the same into an inoperative position, a switch in circuit with said electromagnet, and a timing device for the operation of said switch comprising a member rotating in timed relationship with said adhesive applying means, pins spaced from each other on said rotating member and adapted to actuate said switch, and means to maintain said switch in its operated position for a predetermined length of time.

13. A sheet assembling device comprising means to apply adhesive to separate sheets of paper, and means for rendering said adhesive applying means inoperative, including an electromagnet associated with said adhesive applying means and adapted to displace the same into an inoperative position, a circuit for said electromagnet, two sets of contact means in parallel with each other in said circuit, operating members for each of said contact means, and a rotatable disc having a series of projections extending from each face, each of said operating members extending into the path of one of said series of projections, means for rotating said disc in timed relationship with said sheet assembling device whereby said operating members will be displaced at predetermined intervals to render said adhesive applying means inoperative.

14. A sheet assembling device comprising means to apply adhesive to separate sheets of paper, and means for rendering said adhesive applying means inoperative, including an electromagnet associated with said adhesive applying means and adapted to displace the same into an inoperative position, a circuit for said electromagnet, two sets of contact means in parallel with each other in said circuit, operating members for each of said contact means, a rotatable disc having a series of projections extending from each face, each of said operating members extending into the path of one of said series of projections, means for rotating said disc in timed relationship with said sheet assembling device whereby said operating members will be displaced at predetermined intervals to render said adhesive applying means inoperative, and a switch in series with one of said contact means whereby said contact means may be cut out of said circuit to change the length of said predetermined intervals.

15. Control means for the sheet securing means of a sheet assembling device comprising a member rotatable in timed relationship with said sheet securing means, a control member adapted to be displaced at regular intervals to render said sheet securing means inoperative, and means associated with said rotatable member for displacing said control member, said means including a disc having equidistantly spaced projections thereon, said disc constituting one of a number of discs in each of which the equidistantly spaced projections are spaced from each other by a different amount, and means for securing said disc to said rotatable member.

16. In an adhesive applying device including a roller having a cut away portion and an adhesive applying portion so that a strip of adhesive of predetermined length is applied to successive sheets of paper which are fed past said roller, means for displacing said roller at predetermined times so that certain sheets may be skipped in a predetermined order, and control means for said displacing means comprising a member oscillating in one to one relationship with the rotation of said roller, said oscillating member having a down stroke and an up stroke, a pawl associated with said oscillating member, a ratchet adapted to be advanced step by step by said pawl during the down stroke of said oscillating member, a displaceable control member for controlling the displacement of said roller, means associated with said ratchet for displacing said control member as said ratchet is advanced through certain predetermined steps, and means for retaining said control member in displaced position throughout the next succeeding upstroke of said oscillating member whereby said roller is retained in displaced position throughout the time during which said adhesive applying portion is opposite the sheet being fed past said roller at that time.

17. Timing means for the sheet securing means of a sheet assembling mechanism comprising an oscillating actuating member, a rotatable member adapted to be displaced step by step by said actuating member, power means through which said actuating member gives said rotatable member a step by step rotary movement and comprising a part readily removable from position for enabling the substitution of an alternative part by which the extent of movement of said rotatable member at each step may be varied, and means associated with said rotating member for controlling the operation of said sheet securing means.

ROBERT F. MORRISON.