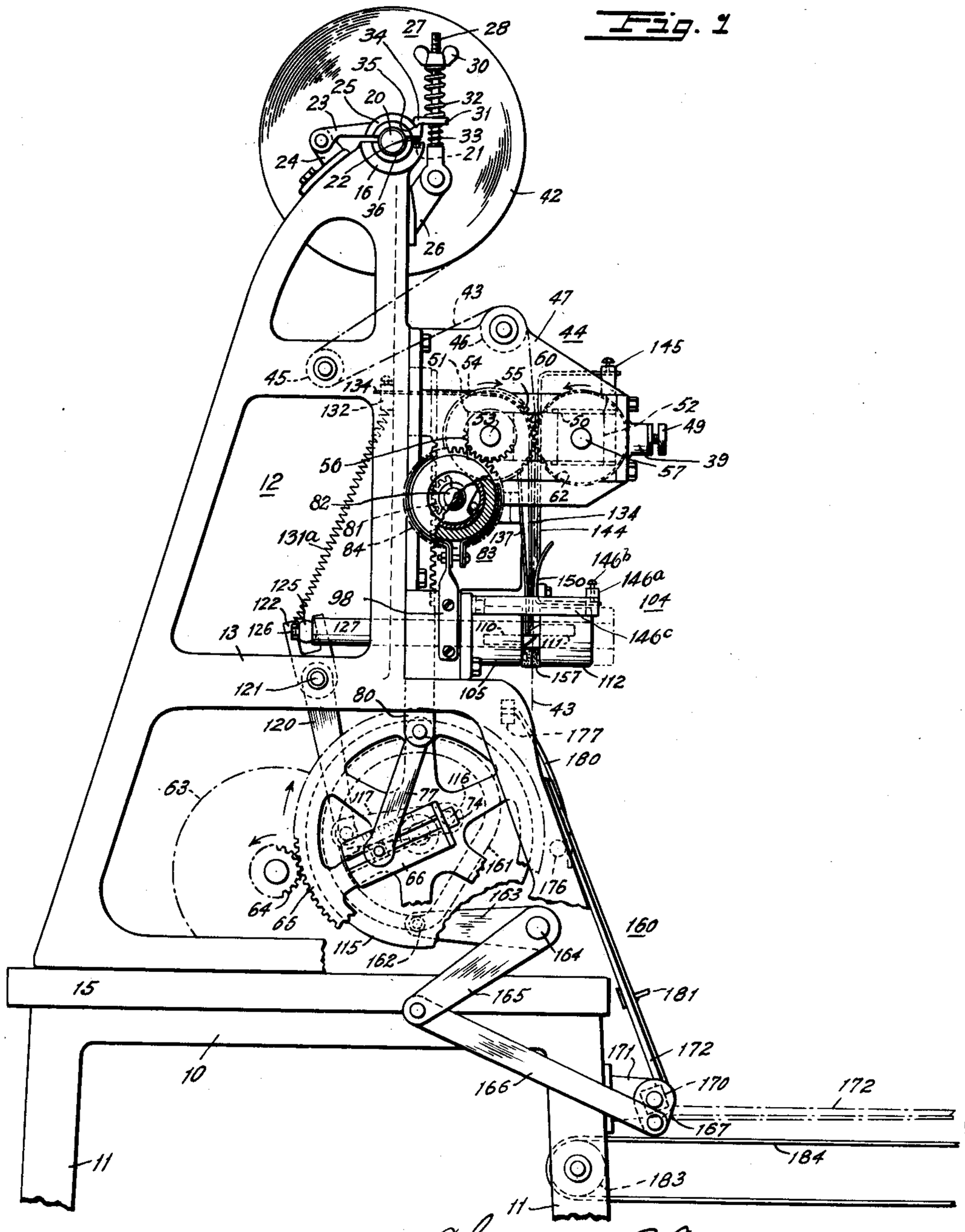
May 9, 1933. C. E. COLEMAN 1,907,742

SHEET CUTTING MACHINE

Filed July 12, 1930 5 Sheets-Sheet 1

Fig. 1



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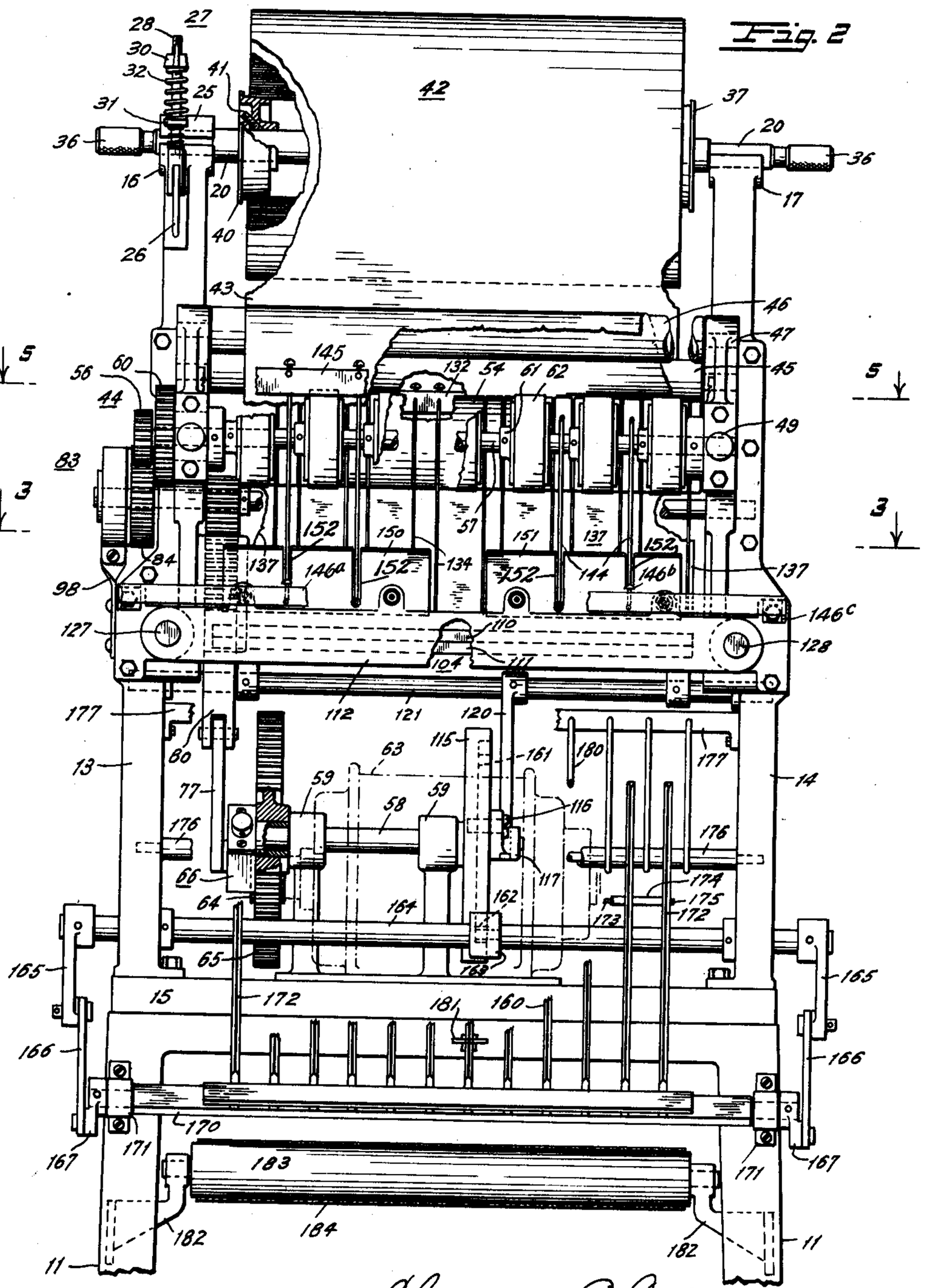
SHEET CUTTING MACHINE

Filed July 12, 1930

5 Sheets-Sheet 2

Fig. 2



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SHEET CUTTING MACHINE

Filed July 12, 1930 5 Sheets-Sheet 3

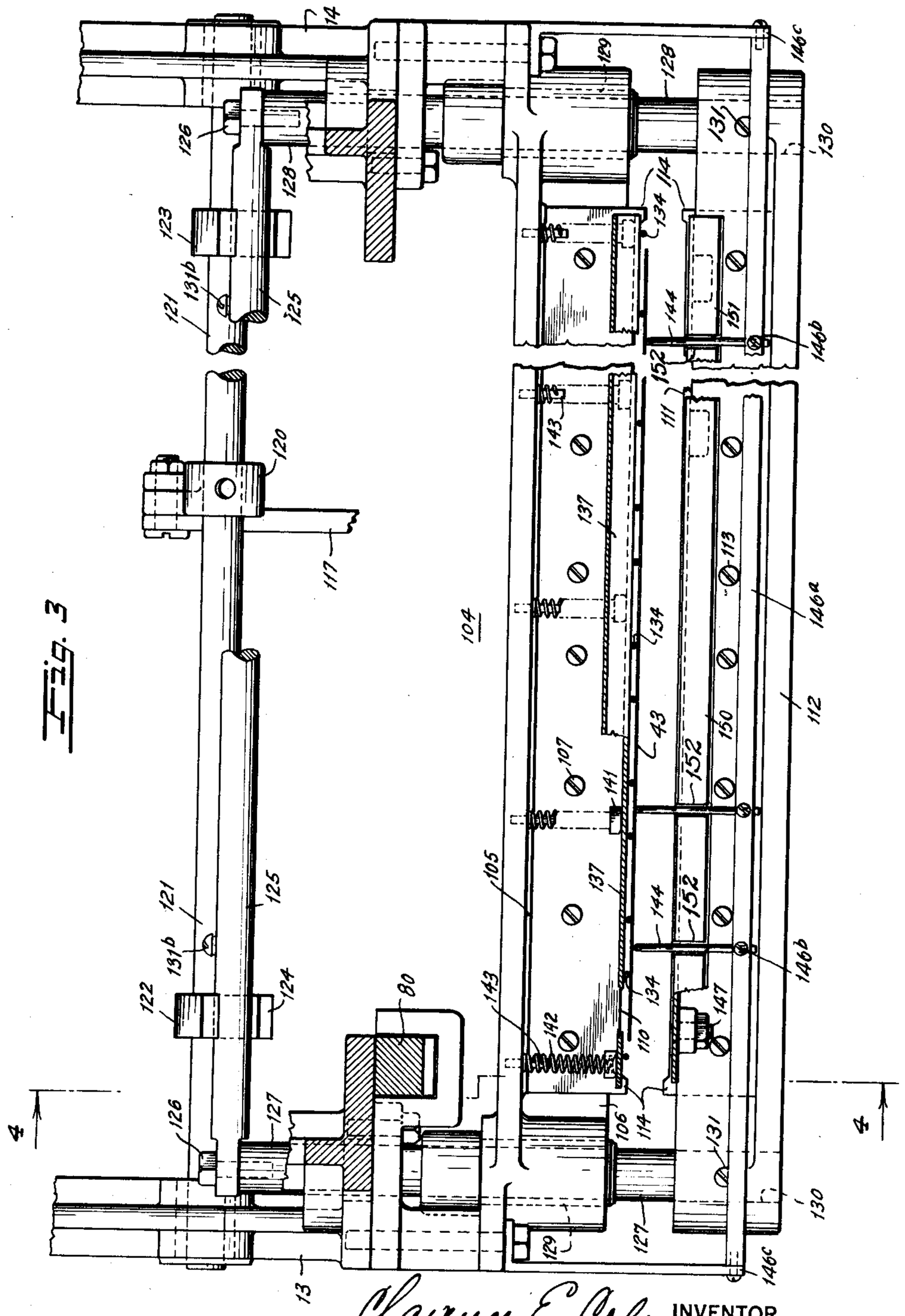

Fig. 3

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May 9, 1933. C. E. COLEMAN 1,907,742

SHEET CUTTING MACHINE

Filed July 12, 1930 5 Sheets-Sheet 4

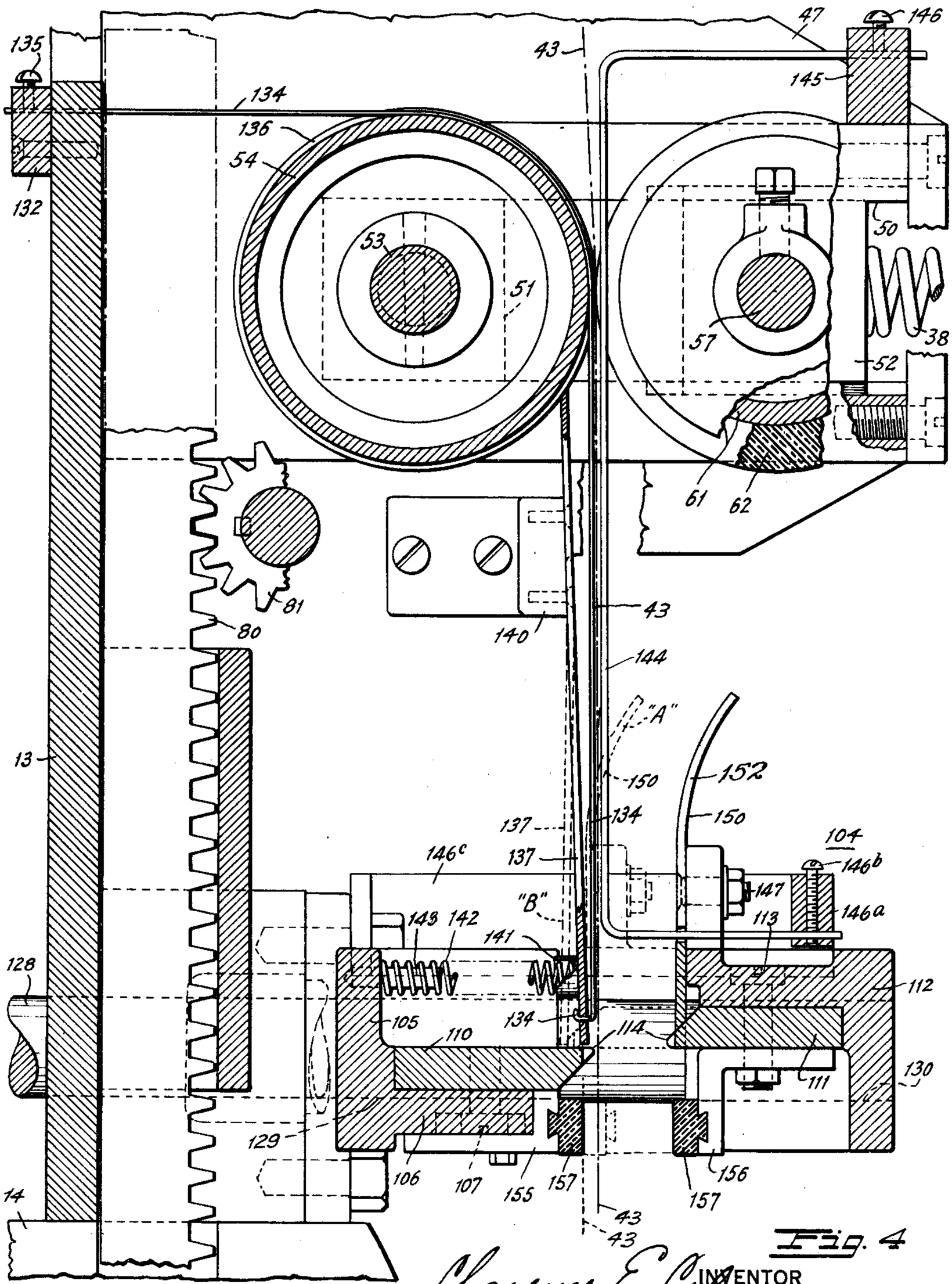

Fig. 4

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SHEET CUTTING MACHINE

Filed July 12, 1930 5 Sheets-Sheet 5

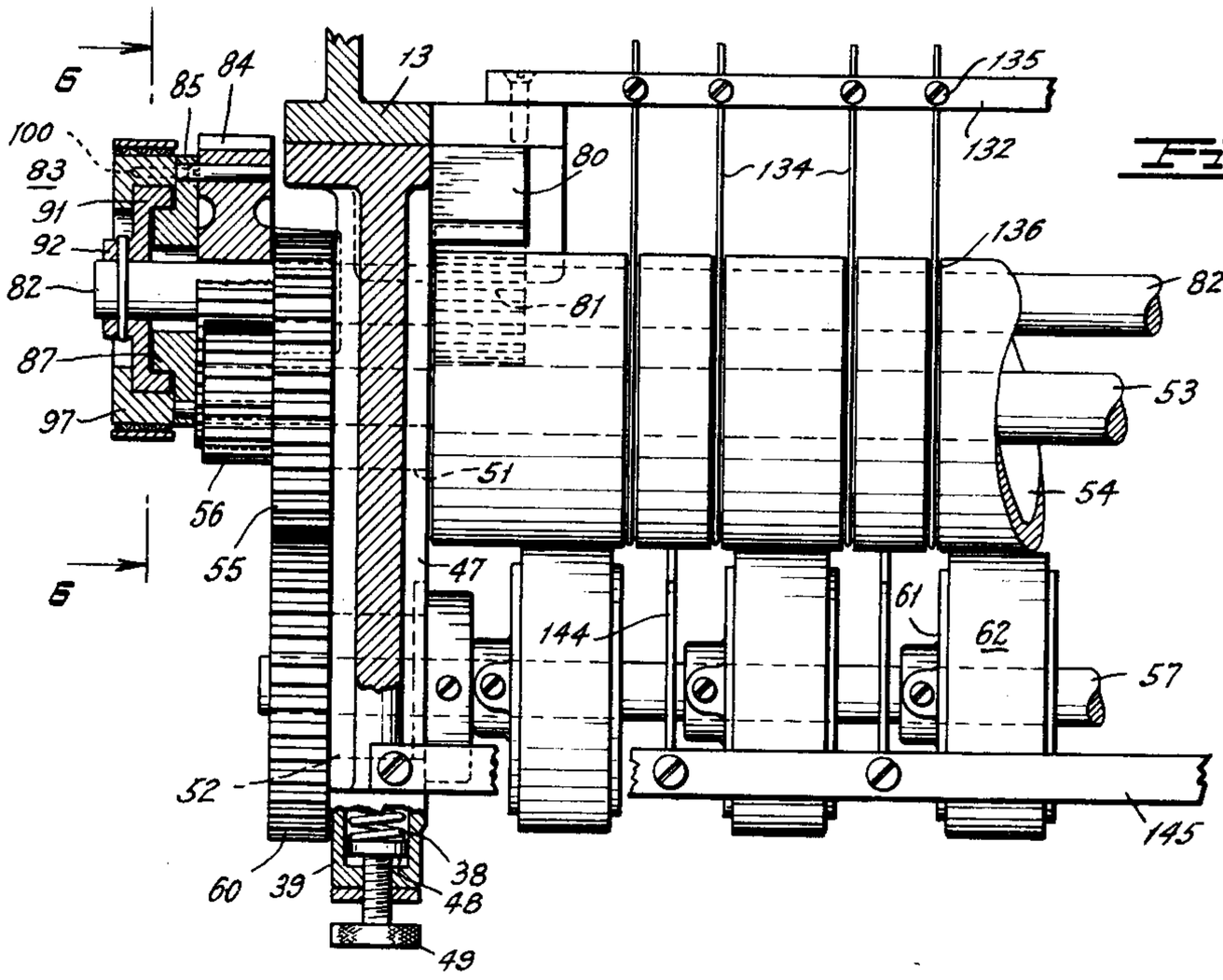


Fig. 5

Fig. 6

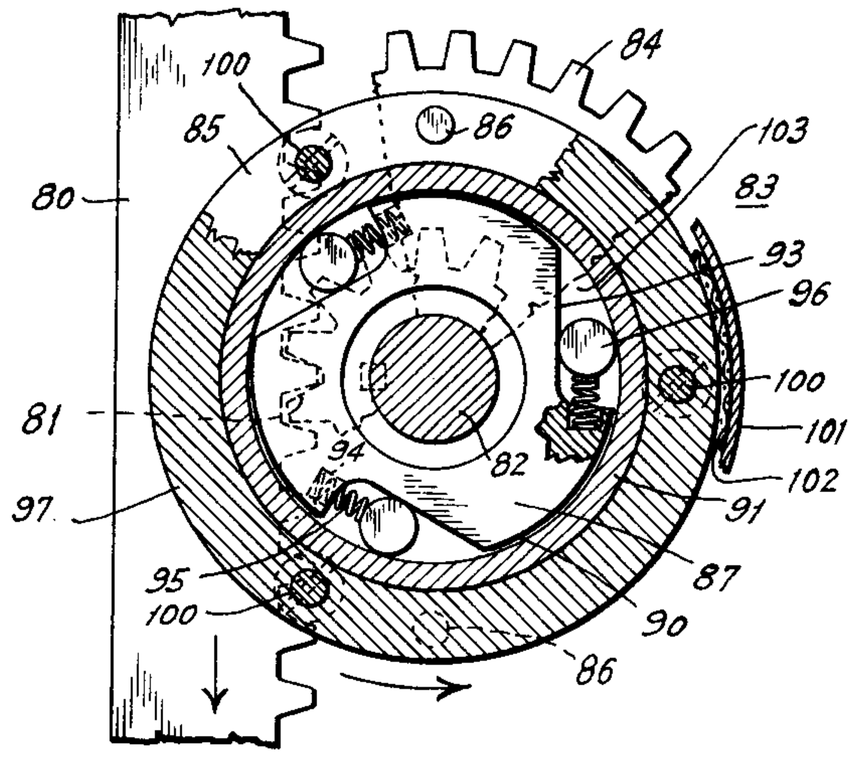
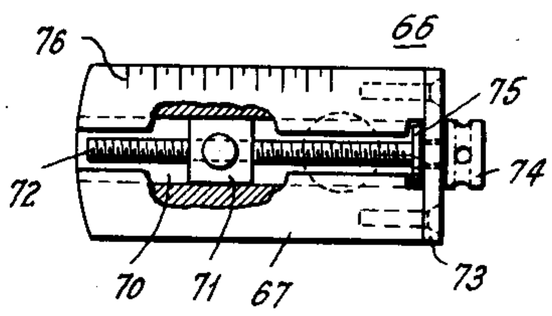


Fig. 7



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UNITED STATES PATENT OFFICE

CLARENCE E. COLEMAN, OF BUFFALO, NEW YORK, ASSIGNOR TO DU PONT CELLOPHANE COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

SHEET CUTTING MACHINE

Application filed July 12, 1930. Serial No. 467,412.

This invention relates to a cutting machine, and more particularly to a machine for cutting sheet-like material.

The present invention is particularly adaptable for employment in that type of machine used for severing thin webs. In the severing of very thin sheets of material such as regenerated cellulose, sometimes known by the trade-mark name as "Cellophane", there is a tendency for these sheets to be ruffled in their passage from the feeding means to the field of action of the cutting means. The passage of these sheets to the severing means through the instrumentality of guiding means must be accordingly accomplished with very little resistance in order to obviate the tendency of these sheets to curl and consequently jam in said guiding means.

The present invention accordingly provides new and improved means for guiding a web-like material in its passage from the feeding means to the field of action of the severing means so that said material is neither ruffled nor curled.

The invention further provides new and improved means for gripping those portions of a sheet adjacent the field of action of the severing means whereby a clean-cut severance of said sheet is effected.

In accordance with a concrete exemplification of the present invention, a plurality of strand-like guide elements are longitudinally disposed between the feeding means and cutting means of the machine. These elements are positioned on both sides of the plane of travel of the web-like material and are preferably arranged to effect a staggered relationship with respect to the opposite sides of said line of travel. A gripping plate is also provided which intermittently cooperates with the guide elements on one side of the web-like material to grip said material adjacent the field of action of the severing means.

It should be noted that through the instrumentality of the present invention, a very simple and effective means is provided for guiding with a minimum amount of resistance a sheet-like material. Also, by providing strand-like elements, the gripping plate effects a more intimate gripping contact due to the capacity of the oppositely disposed guide elements to flex into conforming relationship with said plate.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which:

Figure 1 is a side elevation partly in section of the assembled machine.

Figure 2 is a front elevation partly in section of the assembled machine.

Figure 3 is a sectional plan taken on line 3—3 of Figure 2 showing the cutters in open position.

Figure 4 is a section taken on line 4—4 of Figure 3.

Figure 5 is a partial section taken on line 5—5 of Figure 2.

Figure 6 is a section taken on line 6—6 of Figure 5, and

Figure 7 is a detail view of the adjusting crank unit shown in Figures 1 and 2.

Like reference characters denote like parts in the several figures of the drawings.

In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

The accompanying drawings show a concrete exemplification of the present invention and designate a table 10 (Figures 1 and 2) supported by legs 11 and surmounted by a cutting machine unit 12. The cutting machine comprises two side frame pieces 13 and 14 having the bottom portions thereof joined by a base plate 15 which rests on the table 10. The upper portions of the frame

pieces 13 and 14 are provided with circularly grooved members 16 and 17 which serve as bearing blocks for a spindle 20. The bearing block 16 is provided with a bore 21 for the reception therein of a spring 22. This spring extends beyond the top surface of the member 16, as shown in Figure 1, and cooperates with an arm 23, one end of which is pivotally mounted to a bracket 24 secured to the edge of the frame piece 13. The other end of the arm 23 terminates in a bearing block 25 which serves as a companion piece to the bearing member 16.

Secured to the side of the frame piece 13 is a bracket 26 which has associated therewith a tension device designated generally by the numeral 27. This tension device comprises a rod 28 pivotally mounted on the bracket 26 and having one end thereof threaded for the reception of a winged nut 30. Loosely mounted on the rod 28 is a plate 31 which is held in position intermediate the ends of the said rod by means of coil springs 32 and 33. The plate 31 is provided with a tapered projection 34 which interlocks with a depression 35 on the top surface of the bearing block 25. The function of this tension device 27 will be made apparent hereafter.

The spindle 20 is provided on each end thereof with knurled knobs 36 (Figure 2) for facilitating the setting of the spindle 20 on its supporting bearing members 16 and 17. This spindle has also secured thereto a fixed hub 37 and a slidable hub 40, the position of which can be selectively adjusted along said spindle through the agency of an angularly disposed set-screw 41. Disposed between the hubs 37 and 40 is a roll 42 having a web of material 43 wound thereabout.

For advancing the web 43 into the field of action of the cutting blades hereinafter referred to, there is provided a feeding unit designated generally by the numeral 44. This unit comprises a roller 45 journaled to the frame pieces 13 and 14 and a roller 46 journaled to auxiliary frame pieces 47. These auxiliary frame pieces are secured to the frame pieces 13 and 14 respectively and are provided with rectangular slots 50, one end of which has affixed therein bearing blocks 51 (Figure 1). Proximate the other end of the slots 50 are slidably mounted bearing blocks 52. Journaled in the bearing blocks 51 is a shaft 53 which has affixed thereto a roller 54. This shaft 53 extends outside one of the auxiliary frame pieces 47 and has secured to the extended portion thereof gears 55 and 56, as shown in detail in Figure 5. The bearing blocks 52 have journaled therein a shaft 57, one end of which extends beyond one of the frame pieces 47. The extended portion of the shaft 57 carries a gear 60 which meshes with the gear 55. Also mounted on the shaft 57 in equally spaced intervals are a plurality of sleeve members 61 which are pinned to this shaft and which have mounted thereon roller sheaths 62. These roller sheaths 62 are preferably made of rubber or other yieldable material and have contacting engagement with the roller 54.

It should be observed that the web 43 passes underneath the roller 45, over the roller 46 and between the rollers 54 and 62. The roller 45 serves to cut out the whip of the sheet and to bring about a more ready supply. This roller 45, however, may be eliminated if desired.

The pressure between the rollers 54 and 62 can be selectively adjusted through the agency of a coil spring 38 (Figures 1 and 5) which is disposed in a housing 39 and which has one end thereof impinging on the bearing blocks 52. The other end of the coil spring cooperates with a plate 48, the position of which is selectively adjusted by means of a thumb screw 49. A similar arrangement (not shown) is disposed on the other end of the shaft 57.

In order to effect the rotation of the rollers 54 and 62 in the direction for feeding the web 43 into the field of action of the cutters, there is provided a main source of power which may take the form of the motor 63 (Figures 1 and 2). The shaft of this motor is provided with a pinion 64 which meshes with a spur gear 65. This gear 65 is mounted on a shaft 58 which is journaled in the bearing brackets 59.

Secured to the face of the gear 65 is an adjustable crank unit 66, details of which are shown in Figure 7. This unit consists of a member 67 having a T-slot 70 extending longitudinally thereof. The base of the slot 70 has slidably mounted therealong a block 71 which has a threaded engagement with a spindle 72. Mounted on one end of the member 67 is a plate 73 which is provided with a bore for the passage therethrough of the spindle 72. This spindle 72 is provided with a knob 74 and a collar 75 disposed on both sides of the plate 73 for obviating the longitudinal movement of said spindle. The member 67 is also provided with engraved graduations 76 calibrated to indicate sheet lengths, as will be made apparent hereafter. By means of this arrangement, the position of the block 71 in the slot 70 can be selectively adjusted in response to the rotation of the knob 74.

Pivotally mounted on the block 71 is one end of a pitman 77 (Figures 1 and 2), the other end of which is pivotally mounted to a suitably guided rack member 80. This rack member 80 meshes with a gear 81 fixedly mounted on a shaft 82. This shaft 82 has disposed proximate one end thereof a brake unit designated generally by the numeral 83

(Figures 5 and 6). The purpose of the brake unit is to effect the rotation of the rollers 54 and 62 in a feeding direction only as will be made apparent.

The brake unit 83 consists of a gear 84 which is loosely mounted on the shaft 82 and which meshes with the gear 56. This gear 84 is fixedly secured to a sleeve 85 by means of press-fitted pins 86. This sleeve 85 is provided with a reduced portion 87 having a cam periphery 90 as shown in Figure 6. The reduced portion 87 of the sleeve 85 is embraced by a collar 91 having a hub 92 which is pinned to the shaft 82. This collar 91 defines conjointly, with the reduced portion 87 of the sleeve 85, recesses 93. The portion 87 is provided with bores 94 for the reception therein of one end of the coil springs 95, the other end of which co-operates with rollers 96 disposed in said recesses 93. Embracing the outside of the collar 91 is a flanged sleeve 97 which is secured to the sleeve 85 by means of screws 100. The outer periphery of this flanged sleeve 97 is embraced by a brake band 101 which is provided with a suitable brake lining 102 and which is secured to the frame structure of the machine by means of an integral strap 98 secured to the frame structure of the machine as shown in Figure 1.

On the down stroke of the rack 80 in the operation of the brake unit 83, the gear 81 is rotated in a counterclockwise rotation as seen in Figure 6. This effects a corresponding counterclockwise rotation of the collar 91. As the collar 91 rotates in this direction, the rollers 96 become jammed in the apexes 103 of the recesses 93. This causes the rotation of the sleeve 85 in a counterclockwise rotation and a corresponding rotation of the flanged sleeve 97 and the gear 84. The rotation of the gear 84 is transmitted to the intermeshed gear 56 which effects the rotation of the rollers 54 and 62 through the agency of the intermeshed gears 55 and 60. In this manner the rollers 54 and 62 are turned in a direction to permit the feeding of the web 43 therethrough.

Upon the up stroke of the rack 80, the collar 91 is rotated in a clockwise direction as seen in Figure 6. Under these conditions the rollers 96 will be urged into cooperative engagement with the springs 95 which serve to dampen to a certain extent any tendency for rotating the sleeve 85 in a clockwise direction. The tendency for the sleeve 85 to rotate in this direction is further counteracted by the resistance of the brake band 101 on the flanged sleeve 97, so that the gear 84 remains stationary. It should be noted that by means of this arrangement the rollers 54 and 62 will rotate only during feeding periods thereby obviating the fouling of the web 43 during cutting periods.

For the purpose of severing the web 43, a cutting unit 104 is provided comprising a knife holder 105 (Figures 3 and 4) which is fixed to the frame structure of the machine. This knife holder 105 has a horizontally extending ledge 106, on the top surface of which is secured, by means of screws 107, a cutting knife 110. Cooperating with this knife 110 is a companion knife 111 which is secured to a movable knife holder 112 by means of screws 113. The cutting edges of the knives 110 and 111 are provided at one end thereof with extending portions 114 having arcuated contacting surfaces which serve to facilitate the sliding cooperation of these two knives.

For the purpose of intermittently guiding the knife 111 into cooperative relationship with the knife 110, the shaft 58 has secured to one end thereof a box cam 115 having a transverse pin 116 which has a threaded engagement with said box cam and which is eccentrically mounted with respect to the shaft 58 (Figures 1 and 2). This pin 116 extends behind the face surface of the cam 115 and has pivotally mounted thereon one end of a connecting rod 117, the other end of which is pivotally mounted to one end of a crank lever 120. The other end of the crank lever 120 is pinned to a rock shaft 121 which is suitably journaled in the frame structure of the machine (Figures 1, 2 and 3). Pinned to the rock shaft 121 are two yokes 122 and 123 having forked elements 124 which embrace a rod 125. The ends of this rod 125 are flattened and have secured thereto by means of bolts 126 two mandrels 127 and 128. The fixed knife holder 105 is provided with bores 129 to permit the passage therethrough of these mandrels 127, 128, the ends of which pass through bores 130 in the movable knife holder 112. These mandrels 127 and 128 are fixed to the knife holder 112 by means of set-screws 131. Through the instrumentality of this arrangement, the rotation of the box cam 115 causes the shaft 121 to rock between definite limits causing thereby the corresponding angular oscillation of the yokes 122 and 123. The oscillation of these yokes 122 and 123 is imparted to the mandrels 127 and 128 which effect thereby the reciprocating movement of the movable knife 111 in and out of cooperative relationship with its companion knife 110.

In order to effect a more intimate contact between the knives 110 and 111 during their cutting action, retractile springs 131*a* are provided. These springs are secured at one end thereof to screws 131*b* which are threaded to the rock shaft 121. The other end of these springs 131*a* are suitably attached to a bar 132 mounted on the frame structure of the machine.

For the purpose of guiding the web 43

between the knife 110 and the knife 111 and gripping said web to permit a clean severance thereof, there is provided in the bar 132 a plurality of transverse apertures for the reception therein of one end of piano wires 134. These piano wires 134, about 1/32 of an inch in diameter, are secured to the bar 132 by means of screws 135 which pass through the top of said bar and which impinge on said wires. These wires 134 pass over the roller 54 which is provided for that purpose with annular grooves 136. The other ends of these wires 134 are fastened to the bottom of a guide plate 137. This plate 137 is fastened to a bracket 140 secured to the frame structure of the machine and has its top edge positioned adjacent the periphery of the roller 54. Proximate the bottom edge of the plate 137 which serves as a stripper and tends to prevent the clinging of the cut sheets to the knife 110, there are provided cups 141 which receive one end of springs 142, the other end of which cooperate with the knife holder 105. These springs 142 are guided in place through the agency of spindles 143 having threaded engagement with the knife holder 105. Mounted adjacent the wires 134 and the plate 137 are a plurality of substantially rigid wires 144. These wires 144 are passed around the shaft 57 between the rollers 62 and have the top ends thereof fastened by means of screws 146 to a bar 145, this bar being suitably mounted on the frame structure of the machine. These wires 144 extend in close proximity to the plane of the wires 134, as shown in Figure 4, and are angularly disposed on their lower portions to permit the ends thereof to be secured to a bar 146*a* by means of screws 146*b*. This bar 146*a* has the ends thereof secured to brackets 146*c* extending from the frame structure of the machine. It should be noted that by means of this arrangement, the wires 134 and the wires 144 conjointly serve as a guide for the passage therethrough of the web 43.

For the purpose of gripping the web 43 during the cutting process, the knife holder 112 has secured thereto by means of bolts 147 two gripping plates 150 and 151. The top portions of these plates 150 and 151 are arcuated, as shown in Figure 4, and are provided with notches 152 for the purpose of clearing the wires 144 during the cutting stroke. During this cutting stroke the gripping plates 150 and 151 will move to the position "A", indicated in Figure 4, causing thereby the plate 137 to be flexed under the action of the springs 142 into the position designated by the letter "B", and at the same time permitting the wires 134 to flex into conforming relationship with the plane portion of the plates 150 and 151. In this manner, a more intimate and effective gripping action is produced.

It should be noted that the wires 144 and 134 are relatively positioned to produce a staggered effect so that the web 43 is securely held during the cutting action. It should also be noted that the resistance to the passage of the web 43 into the field of action of the cutting knives 110 and 111 is minimized through the instrumentality of the wire guide members, thereby obviating the fouling of the web.

Under certain conditions it may be necessary to grip the web below the field of action of the knives 110 and 111 in order to effect a clean-cut severance. For this purpose the knife holders 105 and 112 are provided with members 155 and 156, respectively, to which are secured by any suitable means gripping members 157. These gripping members may be made of rubber or any other yieldable material. It should be noted that the gripping members 157 are not absolutely necessary and can be eliminated, if desired. It should also be noted that the gripping plates 150 and 151 and their associated wire elements may be positioned below the field of action of the cutting knives 110 and 111 without departing from the spirit of the invention.

In order to dispose the severed sheets of web outside the field of action of the machine to render them available for use, there is provided a depositing unit designated generally by the numeral 160 (Figures 1 and 2). This unit 160 consists of the box cam 115 having a cam groove 161 in which is cooperatively mounted a cam roller 162. This cam roller is pivotally mounted to one end of a lever 163, the other end of which is secured to a suitably journaled rock shaft 164. Pinned to this rock shaft 164 are the ends of a pair of levers 165, the other ends of which are pivotally mounted to one end of connecting links 166. The other end of these connecting links 166 are pivoted to crank arms 167 which are secured to the ends of a rock shaft 170 journaled in brackets 171. Fixedly secured to this shaft 170 by any suitable means is a plurality of rod-like elements 172 which are positioned along said shaft at equal intervals. The intermediate portions of said elements 172 are held together by means of a rod 173 passing through spacing nipples 174 and having the ends thereof threaded for the reception of bolts 175. These elements 172 in their normal inactive position rest against a rubber roller 176 secured to the frame piece of the machine.

Extending between the frame pieces 13 and 14 is a bar 177 (Figures 1 and 2). Depending from said bar 177 are a plurality of substantially rigid wires 180, the lower por-

tions of which are positioned adjacent the rubber roller 176.

Secured to the legs 11 are bearing brackets 182 in which is journaled a roller 183 for guiding a conveyer belt 184.

Fastened to one of the rod-like elements 172 is a clamp 181 which serves as a detent to the downward movement of the severed sheets.

In the operation of this sheet depositing unit 160, as soon as the web has been cut, the severed sheets gravitate along the wires 180 and the elements 172 until the bottom edges of said sheets reach the clamp 181. The various units of the machine are so coordinated that as soon as these sheets reach the clamp 181 the elements 172 are angularly displaced into a horizontal position so as to deposit the severed sheets on the endless conveyer belt 184. The elements 172 work rapidly so that the air caught against the sheets holds them, and return just as rapidly, so that the sheets once deposited will not be caught up in the vacuum created. By providing a plurality of rod-like elements 172 instead of a continuous surface, said sheets are held more effectively through the agency of the air pressure and any possible curling or rumpling of said sheets is thereby obviated.

It should be noted that the elements 172 have triangular edges so that the severed sheets are in contact with the apex of said edges. This arrangement tends towards a more facile and effective means of depositing the severed sheets on the conveyer 184. Upon the clockwise stroke of the elements 172, as seen in Figure 1, the air will create sufficient pressure to effect cohesion between the contacting surfaces of the sheets and the elements 172. Upon the retrograde movement of the elements 172, the sheets will tend to adhere to these elements. By providing a smaller contacting surface between the sheets and the elements 172 this defect will be obviated.

In starting the machine, the roll of Cellophane or other web-like material is placed on the spindle 20 and locked therein by means of the hub members 37 and 40. The web 43 is then passed underneath the roller 45, over the roller 46 and between the feed rollers 54 and 62. The web is guided in its downward movement between the wires 134 and 144 and into the field of action of the knives 110 and 111. The adjusting crank unit 66 is then regulated in response to the rotation of the knob 74 to effect any selective stroke in the rack 80. This stroke determines the length of the sheet to be severed.

As the gear 65 rotates in the direction shown in Figure 1, the rack 80 in its downward stroke effects the rotation of the feed rollers 54 and 62 in a direction indicated in said figure. This causes the web 43 to be fed between the wires 134 and 144 into the field of action of the knives 110 and 111. The length of the web 43 passing through the rollers 54 and 62 is determined in accordance with the adjustment of the crank unit 66, as already described.

The various units of the machine are so coordinated that by the time the rack 80 has reached the bottom of its stroke the knife 111 has already started to move into cooperative shearing relationship with the knife 110. This movement of the knife 111 is effected through the rotation of the box cam 115 on which is mounted the transverse pin 116. The rotary movement of this transverse pin 116 is transmitted to the shaft 121 through the instrumentality of the connecting rod 117 and the crank lever 120 so as to effect the rocking movement of the shaft 121. This rocking movement of the shaft 121 is in turn imparted to the rod 125 by means of yokes 122 and 123, so that the mandrels 127 and 128 are correspondingly reciprocated. Inasmuch as these mandrels carry the movable knife holder 112 at their ends, their reciprocating movement effects the corresponding movement of the knife 111.

When the rack 80 has reached its lowest position, the tension device 27 serves to counteract the inertial tendency of the roller 42 to continue its rotation. Inasmuch as the feed rollers 54 and 62 are stationary during this particular step in the operation of the machine, such continued movement of the roller 42 would be highly undesirable. When the rack 80 has reached the bottom of its downward stroke, the gripping plates 150 and 151 and the gripping members 157 move to hold the web so that a slight movement of the knife 111 severs said web. This severance of the web 43 is effected during the upward stroke of the rack 80. During this upward movement of the rack 80, the brake unit 83 functions to idle the gear 84. This effects a resultant inactiveness in the feed rollers 54 and 62. During the continued upward movement of the rack 80 after the knife 111 has severed the sheet, this knife is retracted, releasing the gripping elements and permitting the severed sheet to gravitate along the elements 172, as already described.

As soon as the bottom of the severed sheet comes in contact with the clamp 181, the elements 172 start in their angular movement to deposit said sheet on the conveyer 184. This angular movement of the elements 172 is effected through the agency of the box cam 115 with its cooperating roller 162. These elements 172 work rapidly, so that the air caught against the sheet holds it. They return just as rapidly so that the sheet

once deposited will not be caught up in the vacuum created.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

I claim:

1. In a device of the class described, the combination comprising means for completely severing a sheet-like material transversely to its direction of feed, means for feeding said material towards the field of action of said severing means, means for guiding said material towards the field of action of said severing means, said guiding means including a plurality of strand-like elements disposed on both sides of the plane of travel of said material, and a reciprocating member disposed on one side of said material and intermittently pressing said material into engagement with the strand-like elements on the other side for the purpose of gripping said material.

2. In a device of the class described, the combination comprising means for completely severing sheets, means for feeding said sheets towards the field of action of said severing means, a plurality of strand-like elements yieldably mounted on one side of the plane of travel of said sheets, and a reciprocating member disposed on the other side of said plane of travel and intermittently pressing said material into engagement with said strand-like elements for the purpose of gripping said sheets adjacent the field of action of said severing means.

3. In a device of the class described, the combination comprising means for completely severing a sheet-like material transversely to its direction of feed, means to prevent the cut material from clinging to the severing means, means for feeding said material towards the field of action of said severing means, means for guiding said material towards the field of action of said severing means, said guiding means including a plurality of strand-like elements disposed on both sides of the plane of travel of said material, and a reciprocating member disposed on one side of said material and cooperating intermittently with the strand-like elements on the other side for the purpose of gripping said material.

In testimony whereof, I have affixed my signature to this specification.

CLARENCE E. COLEMAN.