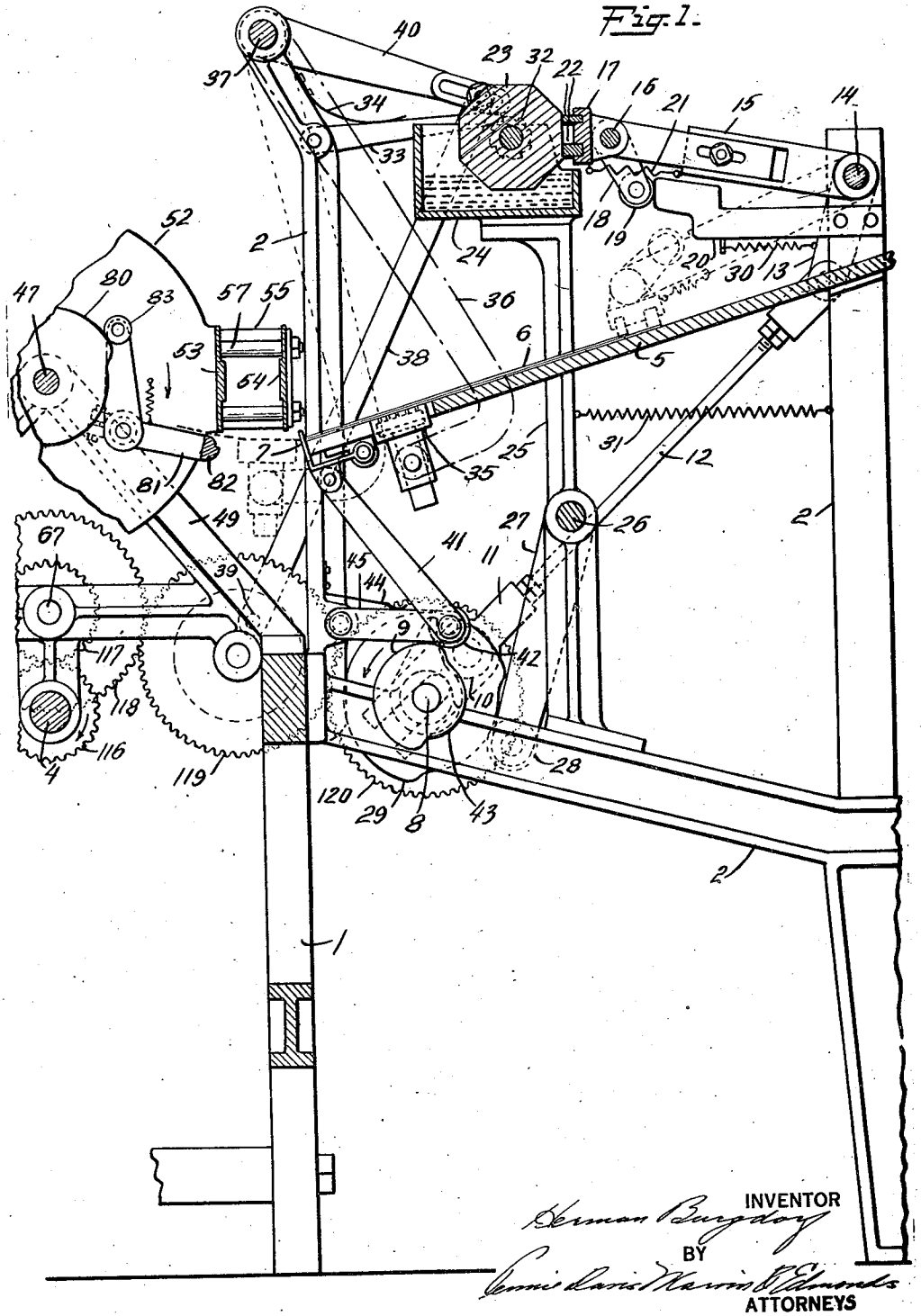
Oct. 25, 1927. 1,646,572

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PAPER BAG MACHINE

Filed July 3, 1926 7 Sheets-Sheet 1

Fig. 1.



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PAPER BAG MACHINE

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Fig. 2.

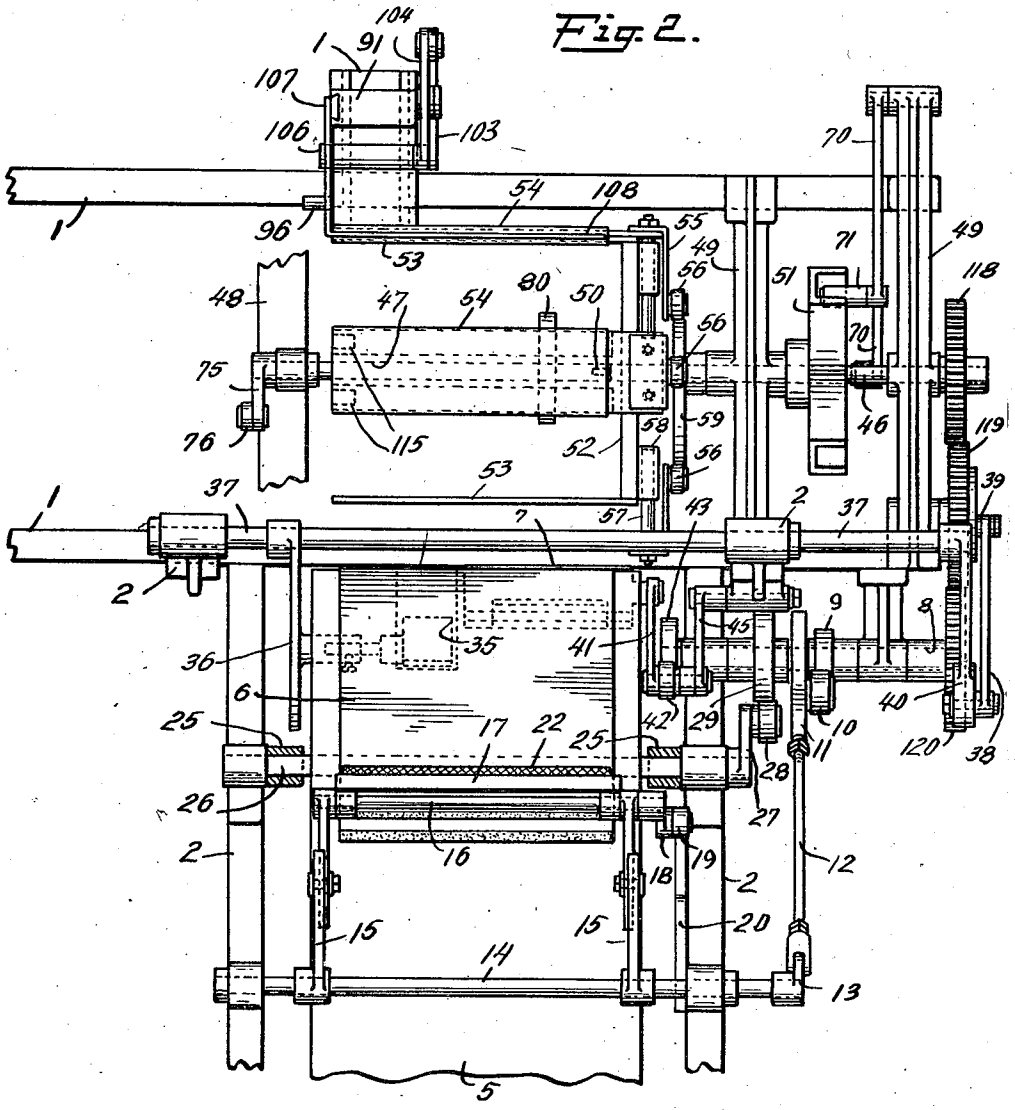
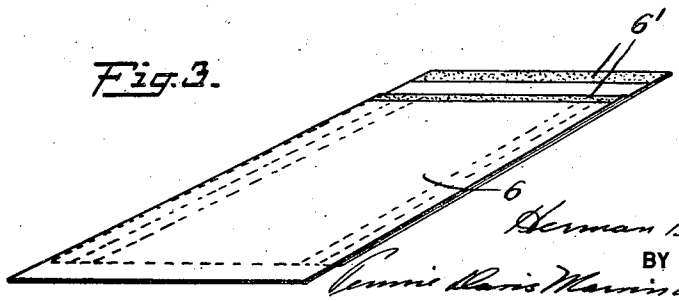


Fig. 3.



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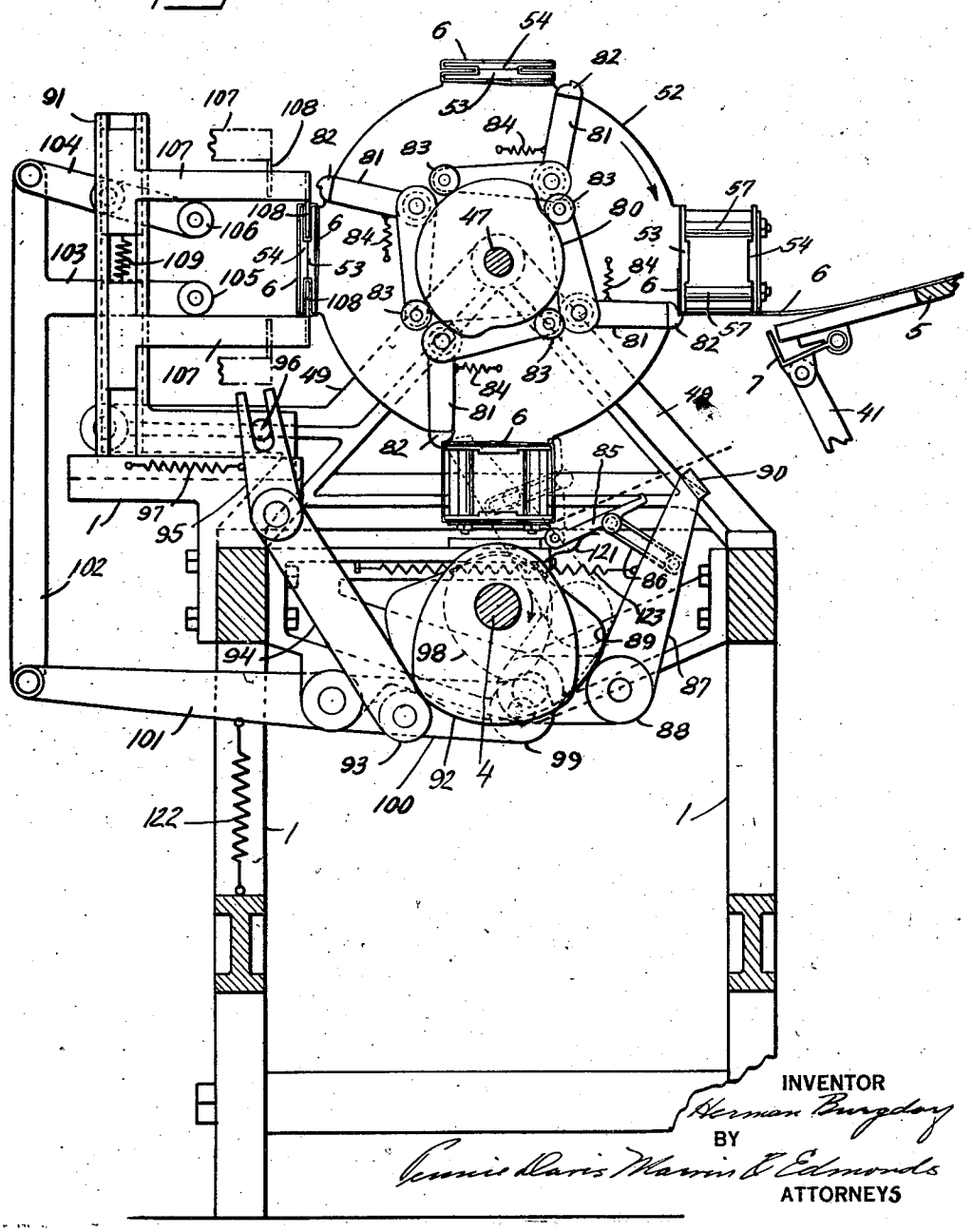
Oct. 25, 1927. 1,646,572

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PAPER BAG MACHINE

Filed July 3, 1926 7 Sheets-Sheet 3

Fig. 4.



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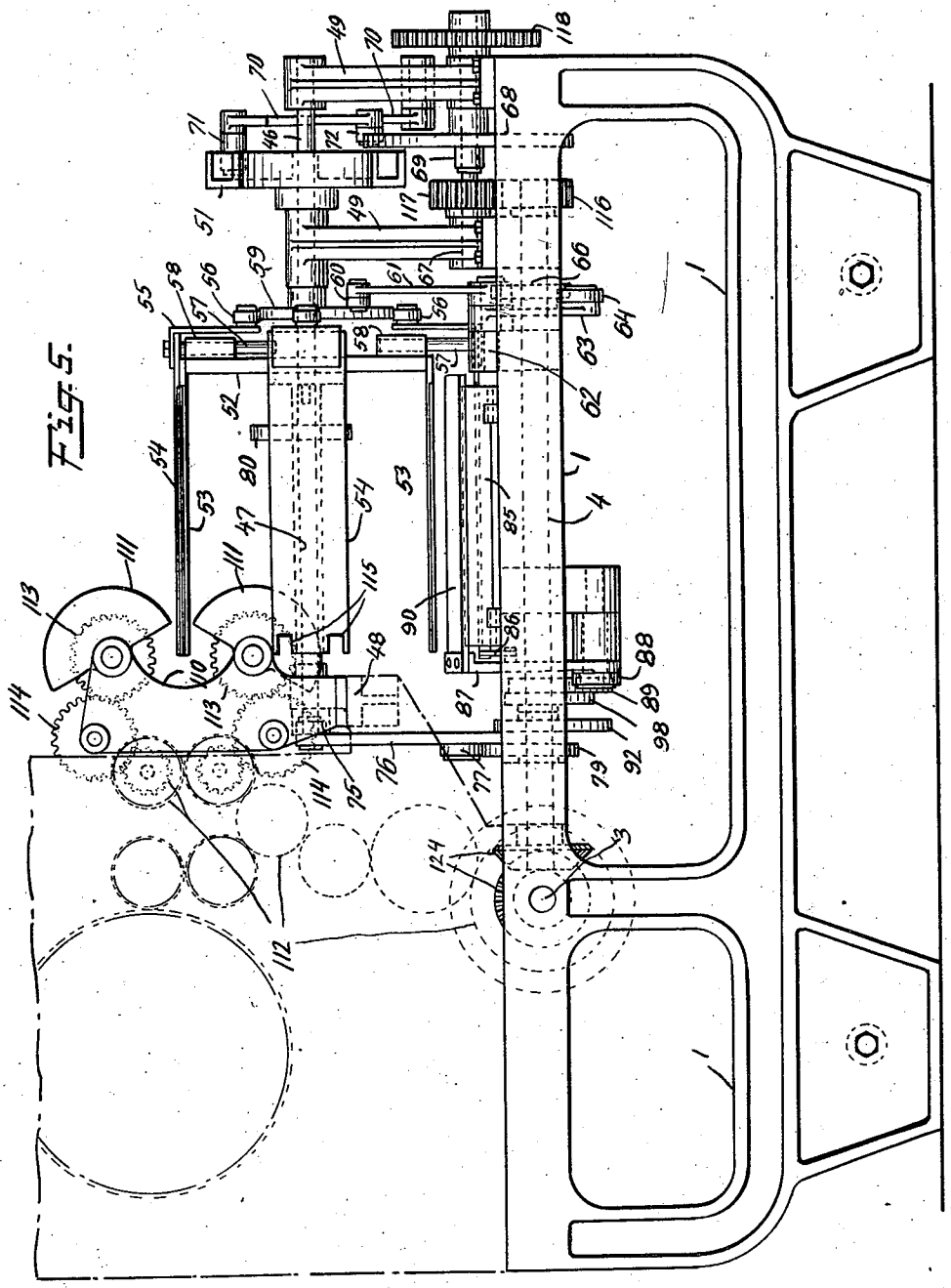
Oct. 25, 1927. 1,646,572

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Filed July 3, 1926 7 Sheets-Sheet 4

Fig. 5.



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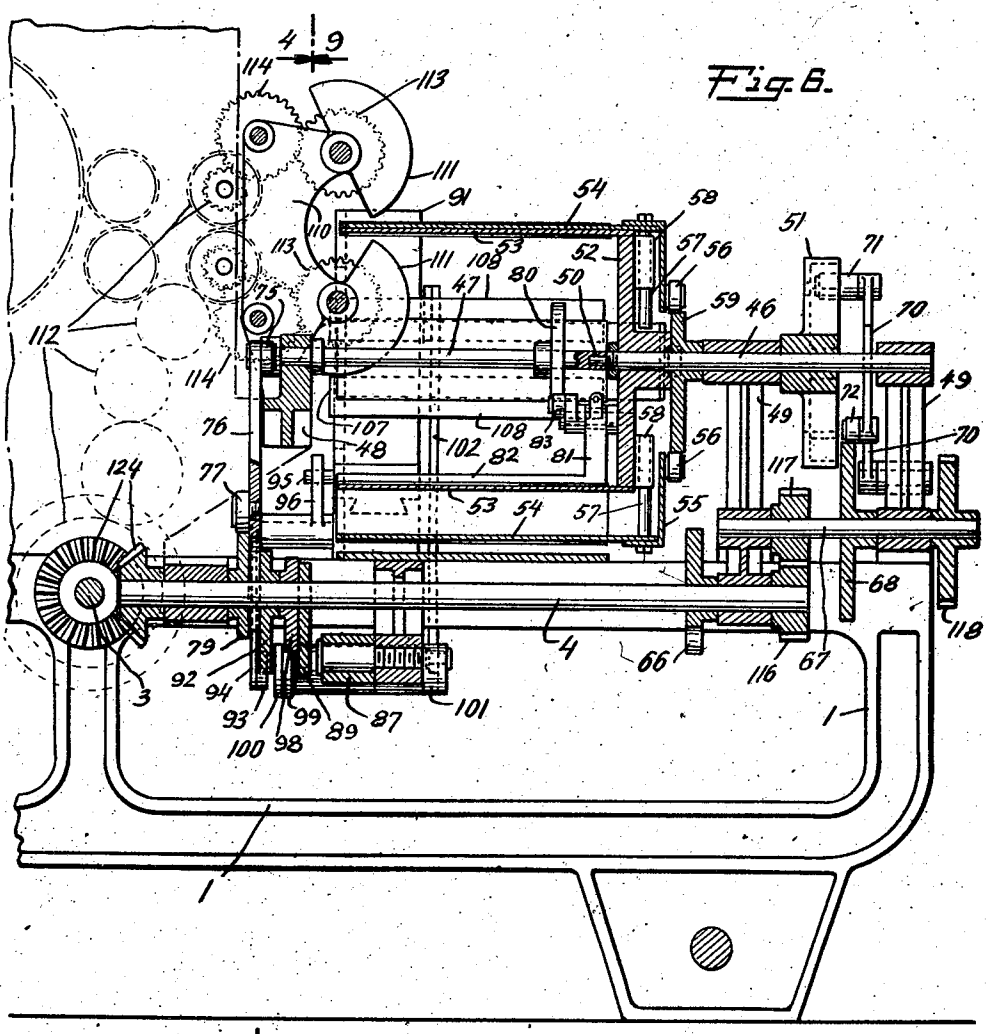
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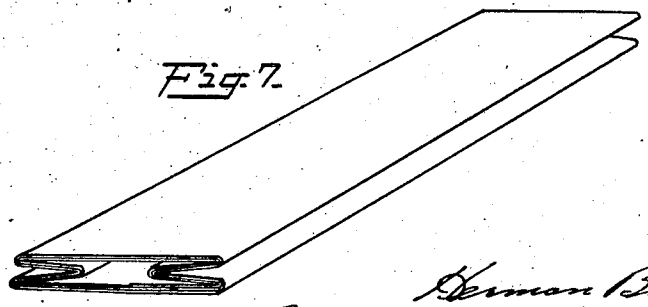
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Fig. 6.



4 9

Fig. 7.



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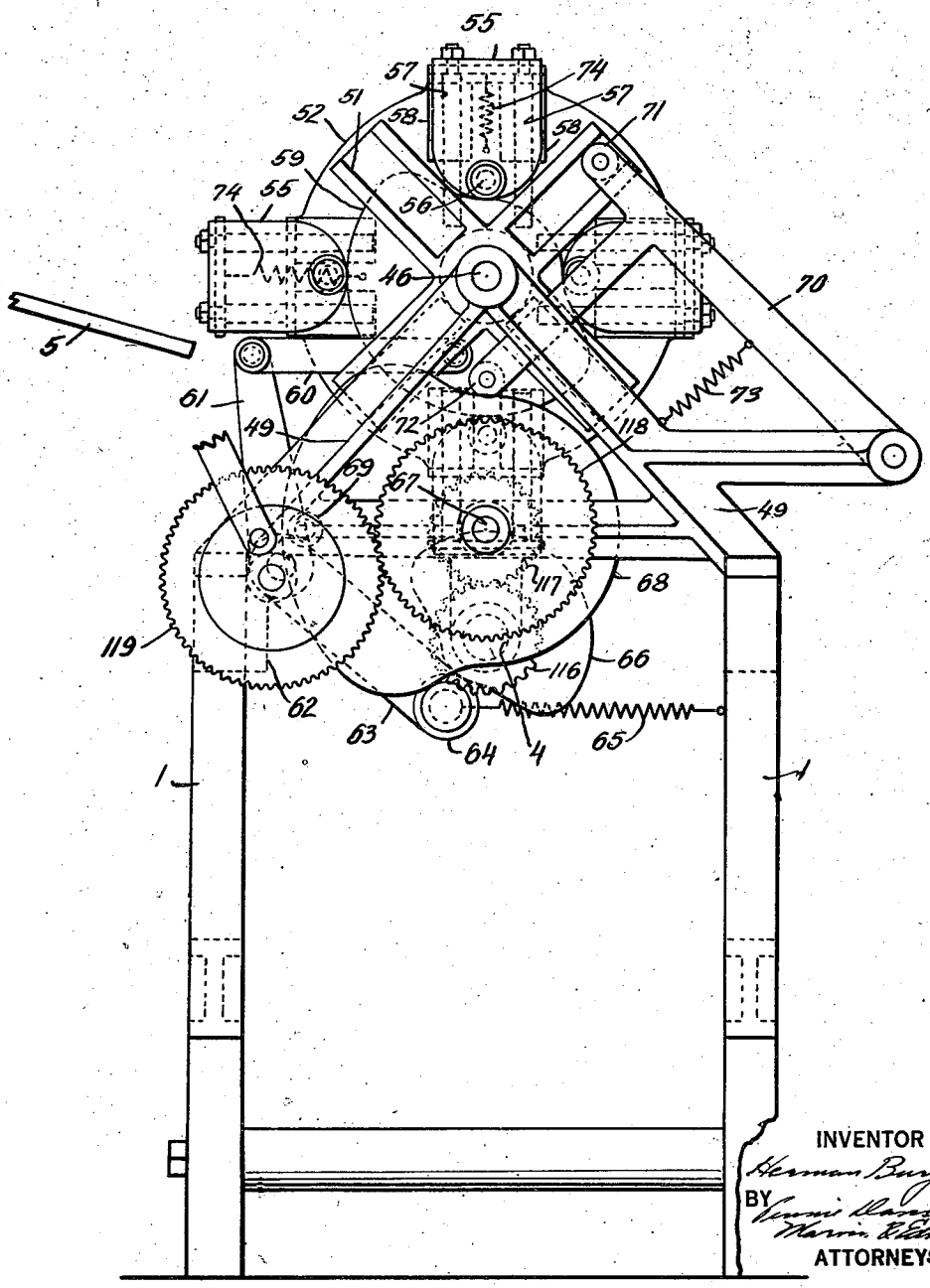
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PAPER BAG MACHINE

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Fig. 8.



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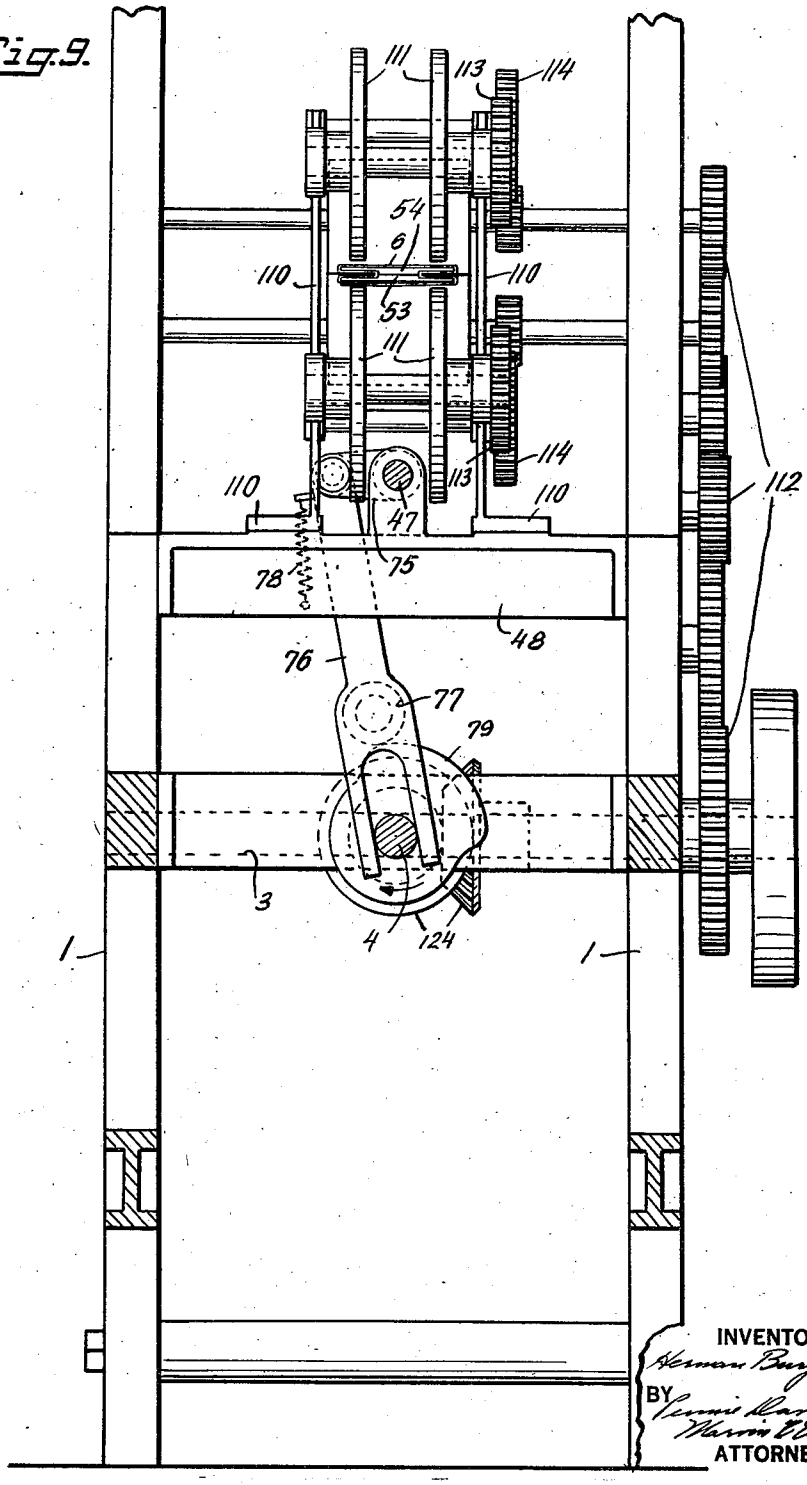
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PAPER BAG MACHINE

Filed July 3, 1926 7 Sheets-Sheet 7

Fig. 9.



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UNITED STATES PATENT OFFICE.

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PAPER-BAG MACHINE.

Application filed July 3, 1926. Serial No. 120,381.

This invention relates to machines for making paper bags, and particularly to apparatus for forming paper tubes which can be converted into paper bags by forming a bottom at one end of each of the tubes.

Heretofore it has been a common practice to make paper bags by means of automatic machines adapted to progressively transform a web of paper into tubing which is in turn converted into bags of predetermined length. The web of paper is ordinarily conveyed lengthwise of the machine and the sides of the web folded up so as to form a continuous tube, sections of which are cut off and converted into bags of the desired length. A machine of this type necessarily occupies considerable floor space, and the machine is so long that the operator often finds it difficult to give the necessary attention to all parts of the machine while it is in operation.

I have found that considerable economy in operation can be effected by constructing a machine which is considerably more compact than the ordinary automatic paper bag machine. Accordingly, one of the objects of my invention is to provide a machine which is much shorter than the ordinary paper bag machine, a machine which can be given adequate attention with a minimum of exertion on the part of the operator. I have found that many advantages can be derived from making the paper bags out of individual sheets of paper, as distinguished from a continuous strip or web of paper, the principal advantage arising from the fact that it is possible to fold the individual strips of paper into a tubular form with the axis of the tube at right angles to the direction of travel of the paper. This makes it possible to construct that portion of the machine which performs the tube-forming operation of unusually small dimensions, thus economizing in floor space and facilitating the control of the machine by the attendant.

According to my invention, I supply individual sheets of paper to an apron or receiving plate where they are subjected to the action of a device which applies glue along one edge of each sheet of paper. The sheets are then automatically fed to a tube-forming device, which serves to fold the paper into tubular form with the axis of the tube at right angles to the direction of travel. The sides of the tube are then creased so as to form the usual bellows construction, and the tubes are then withdrawn axially from the device in which they were formed, and fed to mechanism which forms the bottom portion of the bag. This bottom forming mechanism may be of any ordinary construction, such as that commonly employed for the purpose of forming the so-called square satchel bottoms.

The sheets of paper that I prefer to employ each consist of two layers, one of which may be waxed paper and the other heavy bag paper of the usual character. The two parts of each of the composite sheets are preferably fixed together by glue or other means in such a manner that the ends overlap. My invention includes improved means for applying to two adjacent edges of the component parts of each sheet, a layer of glue which serves to seal the ends of these respective parts of the sheet to each other when the sheet is converted into a tube. Thus the waxed paper which may form the inside of the tube has its two ends sealed together and the corresponding ends of the heavy paper are likewise sealed together.

One embodiment of my improved machine includes an auxiliary frame mounted at one side of the main frame of the machine and adapted to carry the feeding apron, glue applying means and associated parts. This part of the machine is arranged so that the sheets of paper are first fed at right angles to the longitudinal axis of the main portion of the machine. The sheets of paper are formed into tubes having their axes at right angles to the initial direction of feed and parallel with the longitudinal axis of the main portion of the machine.

The various objects and advantages of my invention can be best understood by considering the following detailed description, which is to be taken in conjunction with the accompanying drawings. For the purpose of illustrating this particular embodiment of my invention, I have arbitrarily divided the course of the paper through the machine into three interrelated stages. The mechanism for each stage, and the manner in

which the three stages cooperate, is illustrated in the accompanying drawings, wherein

Fig. 1 represents a sectional elevation showing the mechanism of the feeding stage and the position of the auxiliary frame with respect to the main frame.

Fig. 2 is a plan view of the feeding stage mechanism and its position with regard to the main frame of the machine.

Fig. 3 is a perspective view illustrating the type of composite sheet from which the bag is made.

Fig. 4 is a sectional view of the mechanism of the tube forming stage taken on the line 4—4 of Fig. 6.

Fig. 5 represents a side elevation of the main frame of the machine with the tube forming mechanism at one end and the bottom forming mechanism in phantom at the other end.

Fig. 6 shows an axial section of the tube forming mechanism and its position with regard to the bottom forming mechanism which is shown in phantom.

Fig. 7 is a perspective view of the bellows-sided tube formed by the tube forming mechanism.

Fig. 8 is an end elevation of the tube forming mechanism and the main frame.

Fig. 9 is an elevation, partly in section, along 9—9 of Fig. 6, of the removal mechanism.

The bed or main frame 1 of the machine (see Figs. 1 and 5) carries the tube forming and bottom forming mechanisms, and is of a size and shape suitable for the intended purpose. The auxiliary frame mounted at right angles to the main frame and carrying the feeding mechanism is shown at 2, Fig. 1.

The main drive shaft 3 (see Figs. 5, 6 and 9) is journaled in suitable bearings in the main frame, and drives a power shaft 4 through bevel gearing 124. The power shaft 4, through various gears and cams mounted upon it, drives the feeding and tube forming mechanisms. The bottom forming mechanism and the removal mechanism to the bottom forming stage are driven directly from the main drive shaft 3.

The feeding end of the machine, shown in section in Fig. 1 and plan in Fig. 2, has an inclined receiving table 5 adapted to receive the composite sheets 6 (Fig. 3) from which the bags are made. These sheets consist of one sheet of waxed paper overlaying a sheet of heavy bag paper with the longitudinal edges of both glued together along the dotted lines shown in the figure and the transverse edges overlapping. Inasmuch as the preparation of these sheets does not form part of this invention, it is not deemed necessary to show or describe in detail the manner in which they are formed.

A sheet 6 fed onto the receiving table 5 (see Fig. 1) slides down the incline until its lower edge abuts against the lip of a stop 7 pivoted to the under side of the table 5. While in this position, the sheet has glue applied to it (by means hereinafter described) along the upper edges of the waxed and heavy paper layers, the gummed surfaces being shown at 6′ in Fig. 3.

Driven from the main power shaft 4 through the gears 116, 117, 118, 119 and 120 is a shaft 8 (Fig. 2) carrying a pear-shaped cam 9 connecting with a roller 10 on a bifurcated arm 11 to transmit motion through an adjustable rod 12 and a crank arm 13 to a rock shaft 14 mounted in bearings in the frame 2. Secured to the shaft 14 are two adjustable arms 15 carrying at their outer ends an auxiliary cross shaft 16. Mounted upon the cross shaft 16 is a plate 17 provided with two felt strips 22 and a crank arm 18 carrying a roller 19 so coacting with an extension arm 20 fastened to the frame, as to hold the plate 17 in vertical position against the action of a spring 21.

When the arms 15 carrying the plate 17 are in the position shown in Fig. 1, the felt strips 22 are in contact with one surface of a glue roller 23 mounted to rotate in a glue container 24. A ratchet 32 secured to the roller 23 is actuated by a pawl 33 pivoted to the frame member 2 and held in engagement with the ratchet by a spring 34. The container 24 is set upon uprights 25 which are mounted upon a rock shaft 26. A crank arm 27 secured to this shaft carries a roller 28 contacting with a cam 29 mounted upon the shaft 8.

The spacing of the cams 9 and 29 upon the shaft 8 is such that their transmitted motion is practically simultaneous. Cam 29 actuates the rock shaft 26 through the roller 28 and the crank arm 27. The turning of the shaft rotates the uprights 25, to the left against the action of a spring 31, and moves the glue container 24 away from contact with the felt strips 22. The movement of the container 24 and the glue roller 23 to the left causes the ratchet 32 to lock against the pawl 33 with the result that another face of the roller is rotated into position ready for contact with the felt strips 22.

At the same time that cam 29 is acting to move the glue roller to the left, the cam 9, through the roller 10 on the arm 11, is transmitting motion, against the action of a spring 30, to rock the shaft 14 by way of the rod 12 and the crank arm 13. This motion of the shaft 14 moves the arms 15, carrying the plate 17 with the felt gluing strips 22, from the full line to the dotted line position of Fig. 1. As the arms 15 descend, the roller 19 is released from contact with the arm 20, and the plate 17 with its felt strips 22 rotates into contact with the paper under

the action of the spring 21. Further movement of the cams 29 and 9 brings back the glue container and the arms 15 to their original position and the felt strips 22 contact with the fresh glue surface on the roller 23.

As soon as the felt strips have supplied glue to the two edges of the paper, the sheet is moved forward. The stop 7, pivoted to the under side of the table 5, has attached to it a link 41 carrying a roller 42 riding upon a cam 43 on the shaft 8. The roller 42 is held to the cam under the pressure of a spring 44 acting upon a pivoted link 45, which is pinned to the link 41 at the roller 42. As the shaft 8 rotates, the cam 43 actuates the link 41 through the roller 42 to cause the stop 7 to pivot and drop out of engagement with the lower edge of the paper. As the stop 7 drops out of the way, the paper is moved forward by a suction cup 35, contacting with the under side of the paper through slots in the table 5. The cup is pivoted to the end of a curved arm 36 mounted upon a rock shaft 37 journaled in bearings in the frame 2. A long link 38, pinned at one end 39 to the gear 119, pivotally connects with an adjustable crank arm 40 to transmit motion to the shaft 37.

After the other gears and cams have operated to apply glue to the paper and rotate the stop 7 out of engagement with the lower edge of the sheet, the motion of the gear 119, through the link 38 and the crank arm 40, rocks the shaft 37, and the arm 36 carries the suction cup 35 with the paper held to it, to the position shown in the dotted lines of Fig. 1 where the paper is taken up by the tube forming mechanism.

Parallel with the power shaft 4 and mounted some distance above the bed of the frame 1 is a sectional shaft divided at its midpoint into the two sections 46 and 47 (Fig. 6). Both sections have their outer ends journaled in suitable bearings, one in a cross brace 48, the other in struts 49 forming part of the main frame 1, and their inner ends socketed one within the other at 50 to permit of their independent rotation.

Section 46 of the shaft is actuated by a four arm plate cam 51 and carries a circular disk 52. Equally spaced about the circumference of the disk 52 and extending laterally are four sets of two rectangular forming plates 53 and 54 (Fig. 4), each of very shallow T-section, as best shown in Fig. 1.

The plates 53 are firmly fixed at one end to the disk 52 and have their other ends free and unsupported. The plates 54 also have their corresponding ends free, but are so adapted at their other ends as to be radially movable outwardly away from contact with the plates 53. Angle brackets 55, each carrying a roller 56 and a pair of guide rods 57 slidable in collars 58 formed on the disk 52, are secured to the plates 54 and transmit to them a reciprocatory in-and-out motion produced by the rotation of a cam 59 actuating the rollers 56 against the action of springs 74 (Figs. 6 and 8.)

The cam 59, mounted for free rotation about the shaft 46, is actuated by a pinned link 60 (Fig. 8) connecting with one arm 61 of a bell crank combination pivoted to a stud on a bracket 62 fastened to the main frame 1. The other arm 63 of the bell crank combination has motion transmitted to it through a roller 64 riding under tension of a spring 65 on a cam 66 mounted on the power shaft 4.

Mounted on a secondary shaft 67, which is driven by the power shaft 4 through the gears 116 and 117. (Fig. 6), is a cam 68 carrying a stud 69 sliding in the guide slots of a four arm plate cam 51 (Fig. 8). With each rotation of the cam 68, the stud 69 engages one arm of the plate cam 51 and rotates the shaft 46 through 90°. A pivoted bell crank lever 70, having one arm carrying a roller 71 sliding in the guide slots of the plate cam 51 and the other arm carrying a roller 72 riding on the plate cam 51 under action of a spring 73, is adapted to lock the plate cam 51 in position when the stud 69 on the cam 68 leaves the guide slots after rotating the cam 51 through 90°.

Section 47 of the divided shaft is a rock shaft actuated by a crank arm 75 (Fig. 9), connected to a bifurcated arm 76 carrying a roller 77 riding under action of a spring 78 upon a cam 79 mounted on the power shaft 4.

Secured on shaft 47 and rocking with it is a cam 80 actuating four bell cranks 81 (Fig. 4), pivoted to the disk 52. One arm of each bell crank carries a shouldered finger 82 extending the length, and directly adjacent one edge, of the stationary plates 53. The other arm carries a roller 83, which rides on the cam 80 under action of a spring 84. As the disk 52 rotates, carrying the crank arms with it, the cam 80 imparts a rocking motion to the rollers 83, which causes the fingers 82 to move into and out of contact with one edge of the plates 53.

As the sheet 6 is moved forward into the dotted position (Fig. 1), by the suction cup 35, one of the fingers 82 is moved upward, under action of the cam 80 on one of the rollers 83, to turn over and clamp one edge of the paper against the edge of one of the plates 53, as shown in Fig. 4. Cam 59, meanwhile, is acting on the rollers 56 (Fig. 6), to hold the plates 54 in the outer position (Fig. 4). With the paper thus firmly held, the disk 52 is rotated 90° by the stud 69 acting on the four arm plate cam 51. After the rotation, the roller 71 on the bell crank lever 70 (Fig. 8), drops back into the guide slot on one arm of the four arm plate cam 51 and locks the disk 52 against further rota-

tion until the next operation has been performed. The paper is thus in the lower position with part of it bent around the top, left side and bottom (referring to Fig. 4) of the still separated plates 53 and 54, and part of it extending as shown by the heavy dotted line.

Pivoted along its lower edge to the main frame 1 is a plate 85 with a shoulder shaped to bend the paper around the edge of one of the plates 53. The plate 85 is linked at one end 86, under action of a spring 121, to one arm 87 of a bell crank pivoted to a cross brace of the main frame 1 and carrying a roller 88 riding under tension of a spring 123 against a cam 89 mounted on the power shaft 4. The arm 87 of the bell crank has extending laterally the length of plate 53 a long bar 90 (best shown in Fig. 5).

With the actuation of the bell crank 87 and the linked plate 85 by the cam 89 against the roller 88, the extending portion of the paper (shown heavily dotted in Fig. 4) is bent upward and around the top of the plate 53 by the plate 85 until the previously glued edges overlap the edges still held clamped by the finger 82. Bar 90 then slides over the lapped edges and firmly presses them together. The position taken by the plate 85 and bar 90 at the end of this operation is shown in lightly dotted lines in Fig. 4. The stud 69 on the cam 68 (Fig. 8) then again engages the four arm plate cam 51 and rotates the disk 52 another 90° to the position shown in Fig. 4. The finger 82 still clamps the edge of the paper which has now become a rectangular tube and the cam 59 still holds the plates 53 and 54 in the separated position.

Mounted upon, and adapted to slide back and forth in a dove-tailed groove in an extension of the main frame 1, is a slotted upright 91 (Fig. 4). A cam 92 on the power shaft 4 transmits motion to a roller 93, carried by a pivoted arm 94 mounted on the same hub with a bifurcated arm 95 contacting with a stud 96 in the base of the upright 91, to produce a back and forth movement of the upright against the action of a spring 97.

Corresponding with the motion of the cam 92, a cam 98 on the power shaft 4 contacts with a roller 99 carried at one end of a pivoted lever 100, to produce a rocking motion of the lever against the action of a spring 122. Mounted on the same pivot as the lever 100 is a lever 101 connected to a long arm 102 having a fixed extension 103 and a pivoted link 104. Rollers 105 and 106 carried by the ends of the extension 103 and the link 104, contact with the inner edges of the legs of horizontal T-shaped sliding bars 107 mounted for vertical movement in a dove-tailed slot in the upright 91. Carried at the ends of the legs 107, and extending the length of the plates 53 and 54 are a pair of narrow vertical plates or tucking fingers 108 (Figs. 2 and 4).

Thus the rocking motion of the lever 100 acts upon the extension 103 and the link 104 through the lever 101 and the arm 102 to produce a reciprocating motion of the two sliding bars 107 in opposite phases against the action of a spring 109, and the oscillating motion of the pivoted arm 94 acts upon the bifurcated arm 95 and the stud 96 to produce a back and forth movement of the upright 91. After rotation of the disk 52 to this position, the upright 91 with the bars 107 extended (as shown in the dotted lines of Fig. 4) moves toward the plates 53 and 54 at the same time gradually bringing the tucking fingers 108 together to meet the paper on opposite sides. Simultaneous with this action of the tucking fingers, the cam 59 operates to bring the plate 54 inward toward plate 53. The rectangular tube is thus collapsed upon itself under the combined action of the tucking fingers 108 and the coming together of the plates 53 and 54, to form a bellows-sided tube as shown in Fig. 7. The tucking fingers 108 then separate, and the upright 91 moves backward, at the same time that the shouldered finger 82 is released by the cam 80 and the disk 52 rotated another 90° carrying the plates 53 and 54 to the next or top position (Fig. 4).

The bellows-sided tube held between the closed plates 53 and 54 is now in position to be withdrawn from the plates and moved forward to the bottom forming stage (Figs. 5 and 6).

Mounted in side frames 110 forming part of the cross brace 48 (Fig. 9) are segmental gripping rolls 111 driven by the main drive shaft 3 through the gear train 112 of the bottom forming stage and the gears 113 and 114 mounted in the side frames 110. (Figs. 5, 6 and 9.) As the segmental gripping rolls 111 come together under action of the gears 113 and 114, they grip the end of the bellows-sided tube on top and bottom through slots 115 cut in the ends of the plates 53 and 54 (Figs. 2 and 5), pull the tube off the closed plates, and feed the collapsed and folded tube to the rolls of the next stage (shown in phantom in Figs. 5 and 6), where a satchel bottom is formed and the tube ejected as a completed bag.

By utilizing my invention, it is possible to make with great facility paper tubes of the type commonly used in making paper bags, and this can be accomplished by means of a machine which occupies much less space than the machines ordinarily used for similar purposes. My improved machine is not expensive to manufacture and no great amount of skill is required in order to keep the machine in good running condition.

It is to be understood that my invention

is not limited to the particular embodiment illustrated and described, but includes such modifications thereof as fall within the scope of the appended claims. For example, many of the novel features can be employed in combinations other than the particular combinations illustrated and described, and some of the features may even be eliminated without sacrificing all of the advantages of my invention.

I claim:

1. In a machine for making paper bags, means for feeding individual sheets, rotatable means for forming bellows-sided tubes from said individual sheets, and means for removing the completely formed bellows-sided tubes from said tube-forming means.

2. In a machine for making paper bags, means for feeding individual sheets, rotatable means for forming bellows-sided tubes from said individual sheets with their axes perpendicular to the line of feeding, and means for removing the completely formed bellows-sided tubes from said tube-forming means.

3. In a machine for making paper bags, means for suctionally gripping the bottom surface of and feeding individual sheets, means for forming bellows-sided tubes from said individual sheets with their axes perpendicular to the line of feeding, and means for removing the completely formed bellows-sided tubes from said tube-forming means.

4. In a machine for making paper bags, means for feeding individual sheets, rotatable means for forming bellows-sided tubes from said individual sheets with their axes perpendicular to the line of feeding, and means for removing the completely formed bellows-sided tubes from said tube-forming means in a direction parallel to the axes of the tubes.

5. In a machine for making paper bags, means for forming bellows-sided tubes from individual sheets, said means including circularly mounted plates, means for feeding individual sheets to said circularly mounted plates, and means for removing the completely formed bellows-sided tubes from said circularly mounted plates.

6. In a machine for making paper bags, means for applying glue to one end of individual sheets, means for feeding said individual sheets, rotatable means for forming bellows-sided tubes from said individual sheets with their axes at right angles to the line of feeding, and means for removing the completely formed bellows-sided tubes from said tube-forming means.

7. In a machine for making paper bags, means for momentarily arresting the forward movement of individual sheets, means for applying glue to one end of said individual sheets during the period of rest, means for feeding said individual sheets, means for forming bellows-sided tubes from said individual sheets, and means for removing the completely formed bellows-sided tubes from said tube-forming means.

8. In a machine for making paper bags, means for momentarily arresting the forward movement of individual sheets, means for applying glue to one end of said individual sheets during the period of rest, means for feeding said individual sheets, said arresting, gluing and feeding means operating in part simultaneously and in part successively, means for forming bellows-sided tubes from said individual sheets with their axes at right angles to the line of feeding, and means for removing the completely formed bellows-sided tubes from said tube-forming means.

9. In a machine for making paper bags, means for feeding individual sheets, means for forming rectangular tubes from said individual sheets with their axes perpendicular to the line of feeding, means for tucking two opposite sides of the formed rectangular tubes, means operated simultaneously with said tucking means for collapsing upon each other the other two sides of said formed rectangular tubes to form bellows-sided tubes, and means for removing the completely formed bellows-sided tubes from said tube-forming means in a direction perpendicular to the line of feeding.

10. In a machine for making paper bags, means for advancing individual sheets, means for securing one end of said individual sheets, means for bending said individual sheets to form two sides of a rectangular tube, means for further bending said individual sheets to form the other two sides of a rectangular tube, means for gluing together the edges of said rectangularly formed sheets, means for tucking two opposite sides of said formed rectangular tubes, means for collapsing upon each other the other two sides of said formed rectangular tubes to form bellows-sided tubes, and means for removing the completely formed bellows-sided tubes from said tube-forming means.

11. In a machine for making paper bags from individual sheets, a paper feeding mechanism comprising an inclined table down which sheets may slide by gravity, a pivoted stop for engaging one edge of a sheet to arrest its sliding movement, and a reciprocating device for engaging a sheet and moving it longitudinally toward a tube-forming device.

12. In a machine for making paper bags from individual sheets, a paper feeding mechanism comprising an inclined table down which sheets may slide by gravity, a pivoted stop for engaging one edge of a sheet to arrest its sliding movement, oscillating means for applying glue to one end of a sheet, and a reciprocating device for engag-

ing a sheet and moving it longitudinally toward a tube-forming device.

13. In a machine for making paper bags from individual sheets, mechanism comprising an inclined table down which sheets may slide by gravity, a pivoted stop for engaging one edge of a sheet to arrest its sliding movement, said stop being mounted on said table to engage the lower edge of a sheet, oscillating means for applying glue to one end of a sheet, and a reciprocating device for engaging a sheet and moving it longitudinally toward a tube-forming device.

14. In a machine for making paper bags from individual sheets, a paper feeding mechanism comprising a slotted inclined table down which sheets may slide by gravity, a pivoted stop for engaging one edge of a sheet to arrest its sliding movement, and a reciprocating device moving in said slot for engaging the under surface of a sheet and moving it longitudinally toward a tube-forming device.

15. In a machine for making paper bags from individual sheets, a paper feeding mechanism comprising an inclined table down which sheets may slide by gravity, a pivoted stop for engaging one edge of a sheet to arrest its sliding movement, and a suctionally gripping device for engaging a sheet and moving it longitudinally toward a tube-forming device.

16. In a machine for making paper bags from individual sheets, mechanism comprising an inclined table down which sheets may slide by gravity, a pivoted stop for engaging one edge of a sheet to arrest its sliding movement, oscillating means for applying glue to one end of a sheet during the period of rest, and a reciprocating device for engaging a sheet and moving it longitudinally toward a tube-forming device.

17. In a machine for making paper bags from individual sheets, mechanism comprising an inclined table down which sheets may slide by gravity, a pivoted stop for periodically engaging one edge of a sheet to momentarily arrest its sliding movement, oscillating means for applying glue to one end of a sheet during the period of rest, and a reciprocating device for engaging a sheet after the period of rest and moving it longitudinally toward a tube-forming device.

18. In a machine for making paper bags from individual sheets, mechanism comprising an inclined table down which sheets may slide by gravity, a pivoted stop for engaging one edge of a sheet to arrest its sliding movement, oscillating means for applying glue to one end of a sheet, said means comprising an oscillating arm contacting alternately with a glue supply and with a sheet on said inclined table, and a reciprocating device for engaging a sheet after the gluing operation and moving it longitudinally toward a tube-forming device.

19. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable member, a pair of plates, one fixed and one movable with respect to said member, a paper holding member and means cooperating with said mechanism to fold said individual sheets about said plates.

20. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable member, a pair of plates, one fixed and one movable, mounted on said member, a paper holding member mounted on said rotatable member and means cooperating with said mechanism to fold said individual sheets about said plates.

21. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable disk, a pair of plates, one fixed and one movable, disposed adjacent to the periphery of said disk, a paper holding member pivoted to said disk and means cooperating with said mechanism to fold said individual sheets about said plates.

22. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable disk, a pair of superposed plates, one fixed and one movable, mounted to extend axially from the periphery of said disk, a paper holding member mounted on said disk and extending along one edge of said fixed plate and means cooperating with said mechanism to fold said individual sheets about said plates.

23. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable disk, a pair of superposed rectangular plates, one stationary and one adapted for radial movement, mounted to extend axially from the periphery of said disk, a paper holding member adapted to move into and out of contact with said stationary plate and means cooperating with said mechanism to fold said individual sheets about said plates.

24. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable disk, a pair of radially spaced rectangular plates, one stationary and one movable, mounted on said disk, a paper holding member for engaging a sheet and holding it against one edge of said stationary member and means cooperating with said mechanism to fold said individual sheets about said plates.

25. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable disk, a pair of radially spaced rectangular plates, one stationary and one movable, mounted on said disk, said plates being adapted to move

into and out of contact with each other, a paper holding member co-extensive with said stationary plate for engaging a sheet and holding it against one edge of said stationary plate and means cooperating with said mechanism to fold said individual sheets about said plates.

26. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable disk, a pair of radially spaced rectangular plates, one fixedly and one movably mounted on said disk, said movable plate being adapted at one end thereof to be radially slidable in collars formed on one face of said disk, a paper holding member for engaging a sheet and bending one end thereof around one edge of said stationary plate and means cooperating with said mechanism to fold said individual sheets about said plates.

27. In a machine for making paper bags from individual sheets, mechanism for forming a tube comprising a rotatable disk, a pair of radially spaced rectangular plates, one fixedly and one movably mounted on said disk, a paper holding member adapted to engage a sheet and bend one portion thereof around one edge of said stationary plate and hold another portion against one edge of both plates to bridge the space therebetween and means cooperating with said mechanism to fold said individual sheets about said plates.

28. In a machine for making paper bags from individual sheets, a tube-forming device comprising a rotatable disk, a pair of radially spaced rectangular plates mounted on said disk, a paper holding member adapted to bend one portion of a sheet around one edge of one of said plates and to hold another portion against one edge of both plates to bridge the space therebetween, and a tube closing mechanism comprising a pivoted bending plate and a pivoted pressing bar.

29. In a machine for making paper bags from individual sheets, a tube-forming device comprising a rotatable disk, a pair of radially spaced rectangular plates mounted on said disk, a paper holding member adapted to hold one portion of a sheet around one corner and along one side of said separated plates, and a tube closing mechanism comprising a pivoted bending plate for bending another portion of said sheet around another corner and along another side of said separated plates, and a pivoted pressing bar.

30. In a machine for making paper bags from individual sheets, a tube-forming device comprising a rotatable disk, a pair of radially spaced rectangular plates mounted on said disk, a paper holding member adapted to bend and hold a portion of a sheet along two sides of said separated plates, and a tube closing mechanism comprising a pivoted bending plate adapted to bend and hold the remaining portion of said sheet along the remaining side of said separated plates to form a closed tube, and a pivoted pressing bar adapted to press and seal the meeting edges of said sheet.

31. In a machine for making paper bags from individual sheets, a device for forming bellows-sided tubes from rectangular tubes, comprising a movable upright, tuck fingers carried at the end of reciprocating members slidable in said upright, and means for bringing said tuck fingers together.

32. In a machine for making paper bags from individual sheets, a device for forming bellows-sided tubes from rectangular tubes, comprising an upright movable toward and away from a tube-forming mechanism, tuck fingers carried at the ends of reciprocating members slidable in said upright for engaging opposite sides of a rectangular tube mounted on said tube-forming mechanism, and means for simultaneously bringing said tuck fingers together and moving said upright toward said tube-forming mechanism.

33. In a machine for making paper bags from individual sheets, a tube removing mechanism, comprising a plurality of gripping rollers adapted to contact with a tube mounted on a tube-forming device to remove the tube in an axial direction.

34. In a machine for making paper bags from individual sheets, a tube removing mechanism, comprising a plurality of opposed segmental gripping rollers adapted to contact on top and bottom with one end of a tube mounted on a tube-forming device, to remove the tube from the device.

35. In a machine for making paper bags, mechanism for forming tubes from individual sheets, comprising a rotatable disk, a plurality of stationary and movable plates mounted thereon, means for rotating said disk ninety degrees at a time, means for locking said disk in position after each rotation, and means cooperating with said mechanism to fold said individual sheets about said plates.

36. In a machine for making paper bags, mechanism for forming tubes from individual sheets, comprising a rotatable disk, a plurality of stationary and movable plates mounted thereon, means for moving said plates into and out of contact mounted on said disk, means for rotating said disk ninety degrees at a time, means for locking said disk in position after each rotation, and means cooperating with said mechanism to fold said individual sheets about said plates.

37. In a machine for making paper bags, a device for forming tubes from individual sheets, comprising a rotatable disk, a plurality of stationary and movable plates mounted thereon, a plurality of paper holding members also mounted thereon, means for successively moving said disk into posi-

tion with a feeding mechanism to receive a sheet, into position with a tube closing mechanism to form said sheet into a closed tube, into position with a bellows-sided tube-forming mechanism to collapse said closed tube to form a bellows-sided tube, and into position with a tube removing mechanism to remove said bellows-sided tube, and means for locking said disk in each of said positions.

38. A method of making paper bags from individual sheets, which comprises feeding the individual sheets to a set of rotating forming plates, forming the sheets into bellows-sided tubes with their axes perpendicular to the line of feeding, removing the tubes from the forming plates, feeding said tubes to a bottom forming machine, and forming bottoms on said tubes.

39. A method of making paper bags from individual sheets, which comprises applying glue to one edge of the individual sheets, feeding the sheets to a set of rotating forming plates, forming the sheets into bellows-sided tubes with their axes perpendicular to the line of feeding, removing the tubes from the forming plates, feeding said tubes to a bottom forming machine, and forming bottoms on said tubes.

40. A method of making paper bags from individual sheets, which comprises feeding individual sheets to one of a plurality of sets of rotating forming plates, forming the sheets into rectangular tubes with their axes perpendicular to the line of feeding, collapsing the rectangular tubes to form bellows-sided tubes, removing the tubes from the forming plates, feeding said tubes to a bottom forming machine, and forming bottoms on said tubes.

41. A method of making paper bags from individual sheets, which comprises feeding individual sheets to one of a plurality of sets of rotating forming plates, forming the sheets into bellows-sided tubes with their axes perpendicular to the line of feeding, removing the tubes from the forming plates in a line parallel to the axes of the tubes, feeding said tubes to a bottom forming machine, and forming bottoms on said tubes.

42. A method of making paper bags from individual sheets, which comprises feeding individual sheets to one of a plurality of sets of forming plates mounted on a disk rotating about an axis perpendicular to the line of feeding, forming the sheets into bellows-sided tubes with their axes parallel to the axis of the disk, removing the tubes from the forming plates in a line parallel to the axis of the disk, feeding said tubes to a bottom forming machine, and forming bottoms on said tubes.

43. A method of making paper bags from individual sheets, which comprises suctionally feeding individual sheets to one of a plurality of sets of forming plates mounted on a disk rotating about an axis perpendicular to the line of feeding, forming the sheets during half a revolution of the disk into bellows-sided tubes with their axes perpendicular to the line of feeding, removing said tubes from the ends of the forming plates, feeding said tubes to a bottom forming machine, and forming bottoms on said tubes.

In testimony whereof I affix my signature.

HERMAN BURGDORF.