July 19, 1938. G. W. POPPE 2,124,209

PROCESS AND MACHINE FOR MAKING BAGS

Filed July 31, 1936 4 Sheets-Sheet 1

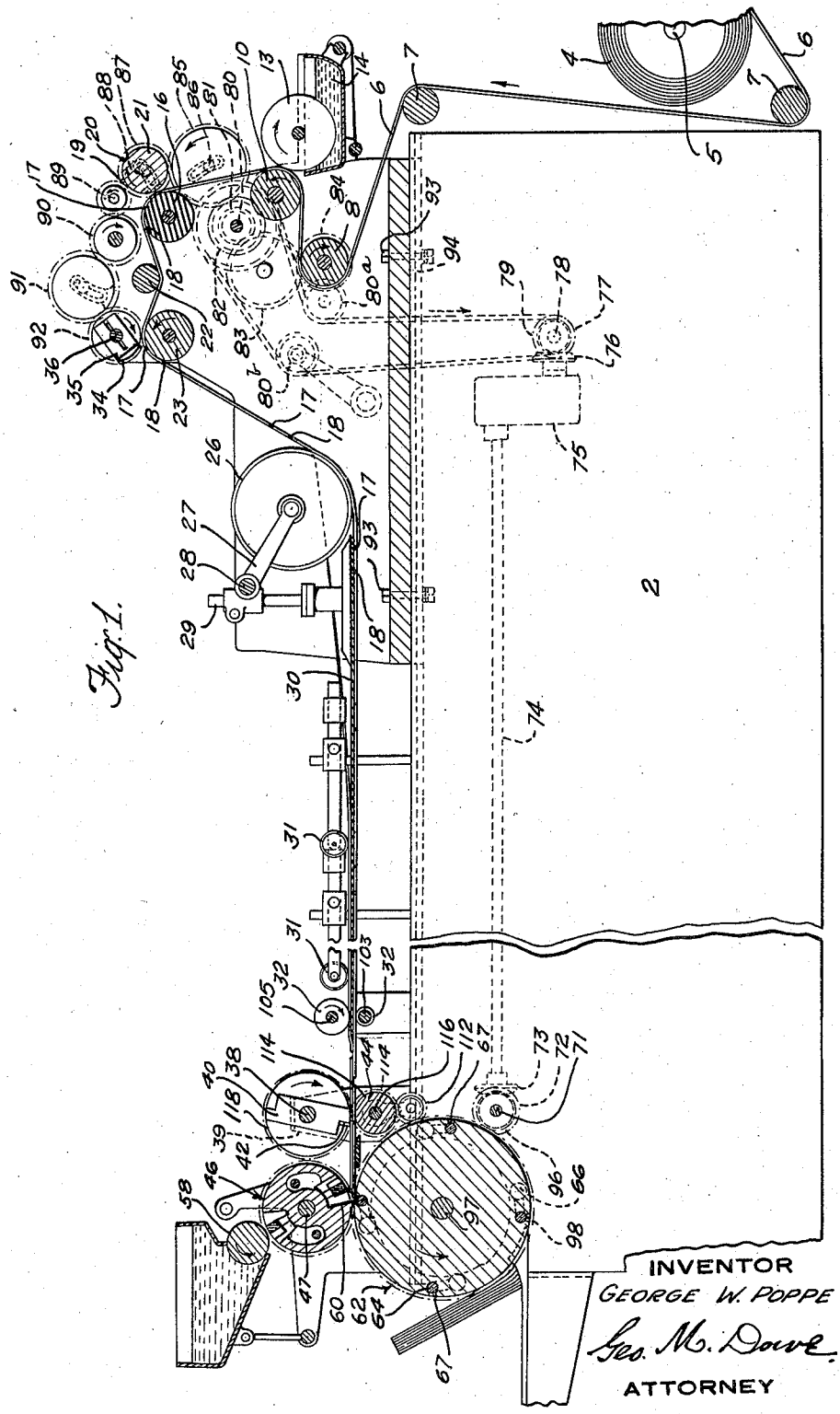

Fig. 1.

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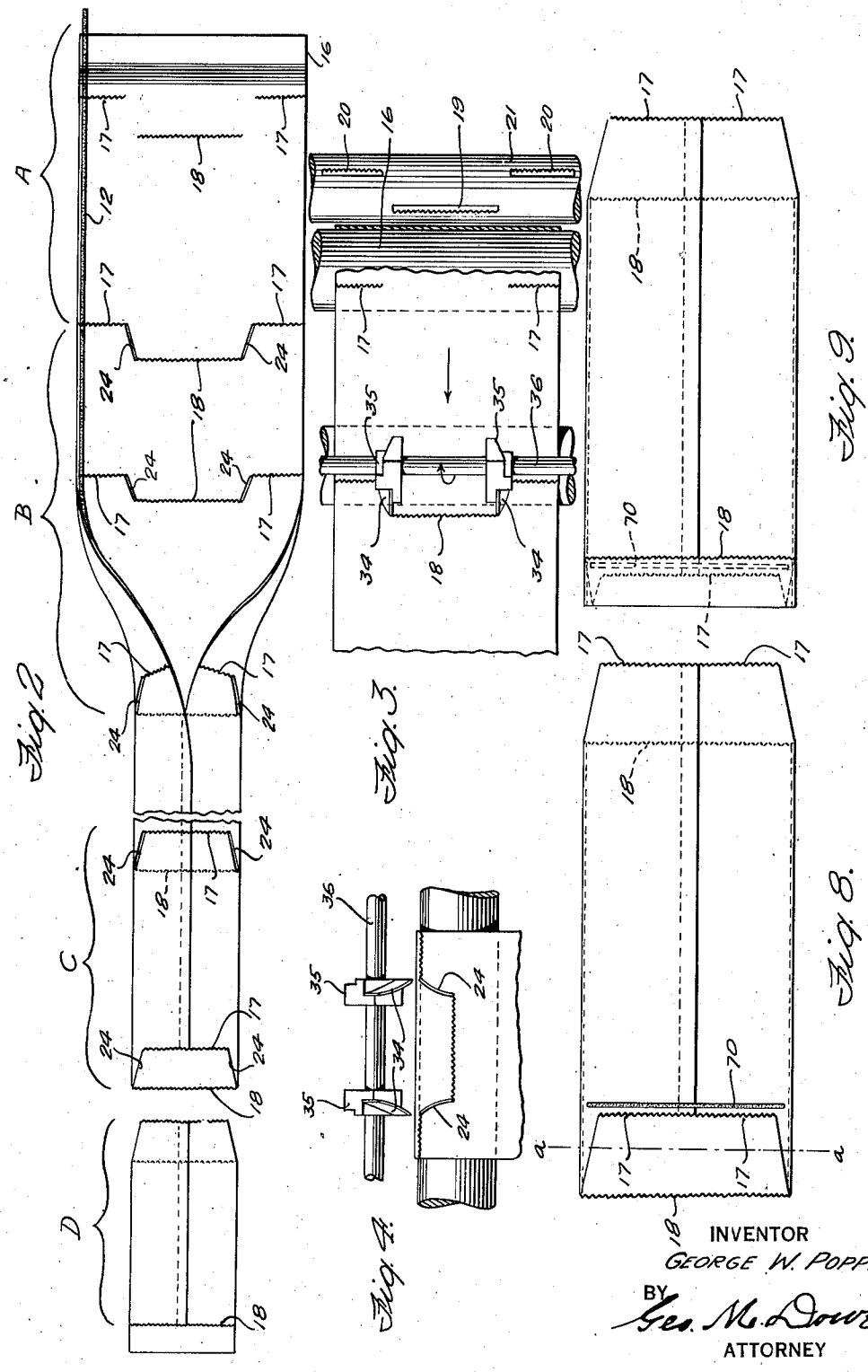

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 8.

Fig. 9.

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Fig. 5.

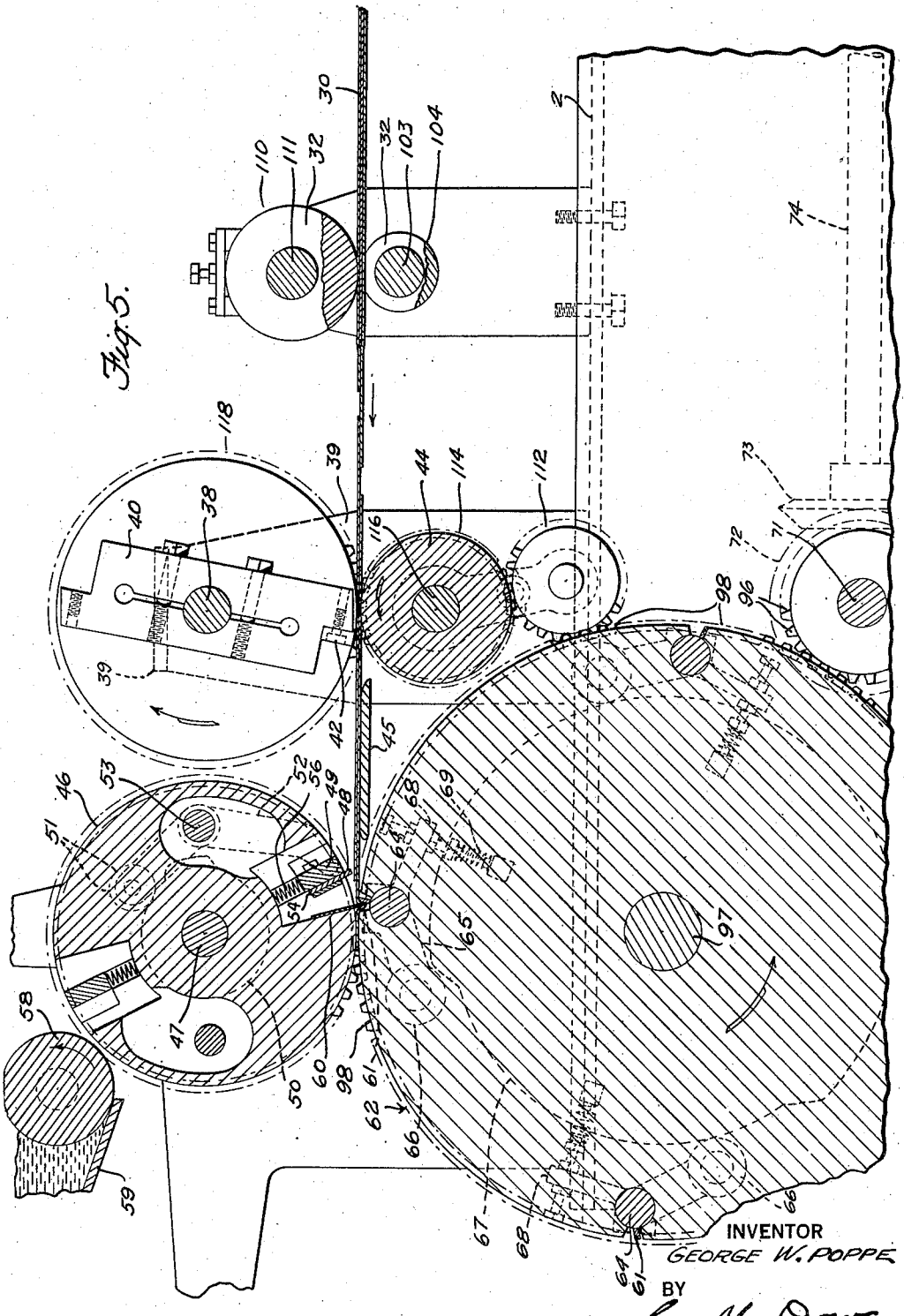

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Fig. 6.

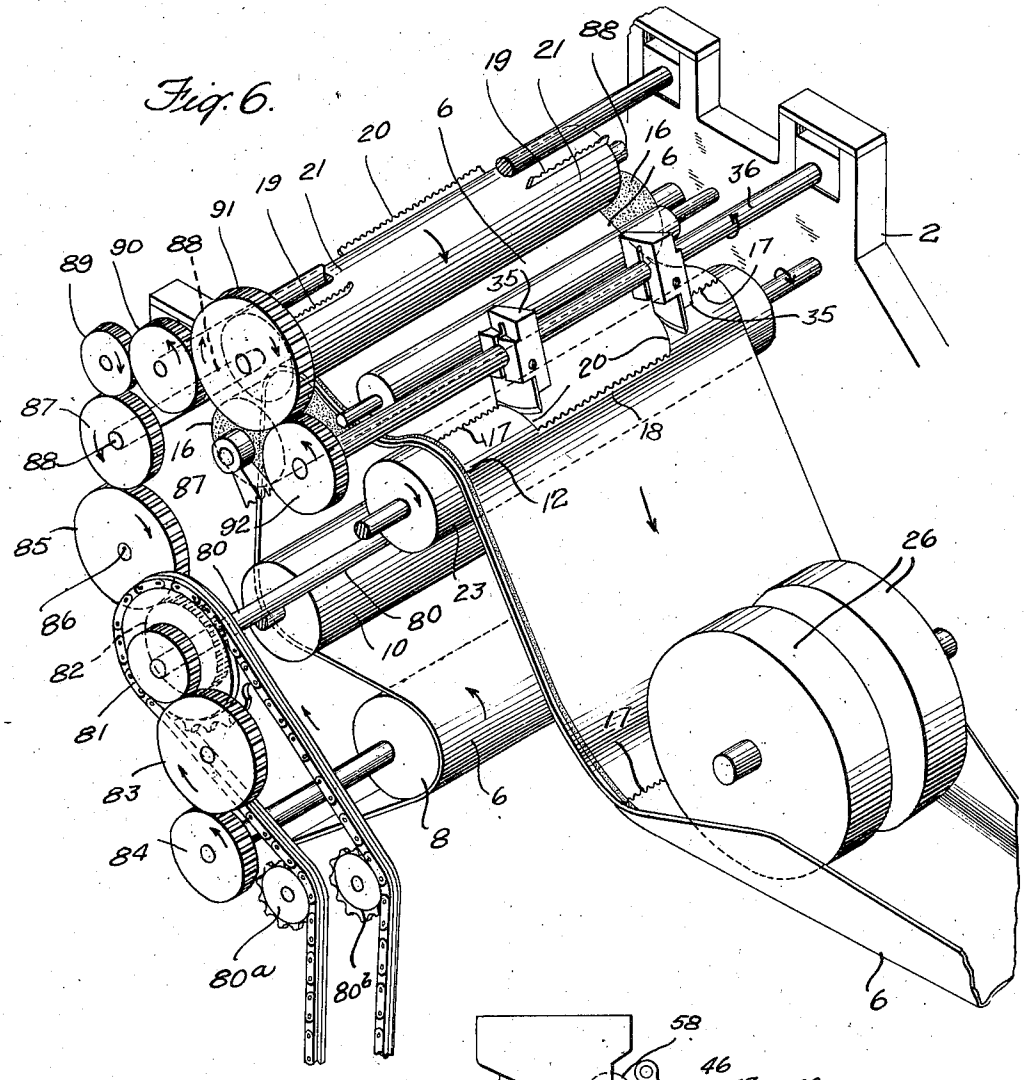
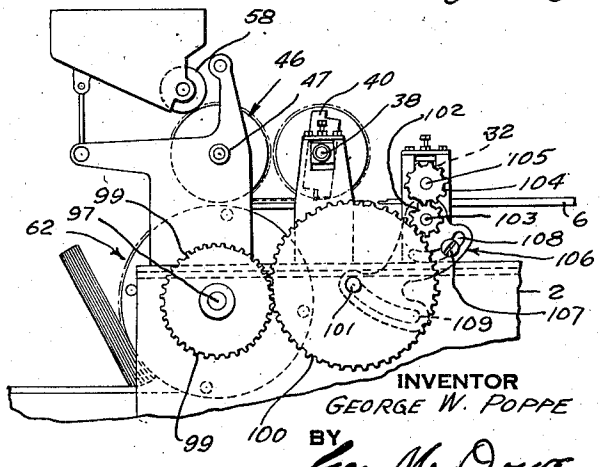


Fig. 7.



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UNITED STATES PATENT OFFICE

2,124,209

PROCESS AND MACHINE FOR MAKING BAGS

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Application July 31, 1936, Serial No. 93,599

5 Claims. (Cl. 93—18)

This invention relates to a process and machine for making paper bags.

In my Reissue Patent 19,921 granted April 7, 1936, I have disclosed a method and apparatus for making bags in which a web of paper is continuously fed through the machine and cuts are made at intervals in the web which cuts determine the sides of the closing flap in the finished bag. The web is folded to form a bag tube which is then severed along lines which meet both ends of the cuts. The machine disclosed in said reissue patent is provided with severing mechanism in the form of a striker bar or bars which cut off bag lengths from the continuously moving tube, the cutting being effected through the medium of serrated edge knives.

In making bags according to this method, there is no waste of paper and furthermore where the longitudinal cuts are at a slight angle gussets are formed at the bottom of a bag tube section. The bottom fold may then include but one bag wall and therefore the bag bottom may be made smaller than the closing flap. This results in saving of paper over that necessary to be used where both bag walls are included within the bottom fold.

It has been proposed to make a bag by preliminarily perforating the web along transverse and general longitudinal lines which determine the size of the closing flap to be produced, then folding the web to form a tube and finally completely severing the tube into bag lengths along the lines of the perforations. Such a method is described in the patent to Potdevin 1,941,272, December 26, 1933. The patentee recognizes the desirability of having a small bottom relative to the length of the closing flap and in order to produce such small bottom, he contemplates cutting off a portion of a tube length before the bag is bottomed. This cut-off portion however, constitutes waste.

It has also been proposed to do away entirely with the striker bar in machines of this general character although utilizing the Potdevin method of first perforating or weakening the web along transverse and general longitudinal lines which lines of weakening determine the size of the closing flap to be produced. The web is then folded and pasted in the usual way and the severance of individual bag tube lengths from the continuously advancing tube is effected as follows: The folded tube passes from the usual feed rolls to the bottom forming cylinder which cylinder rotates at a higher peripheral speed than the feed rollers, and as soon as the bag bottom enters the usual clamp in said bottom forming cylinder, a bag tube length is snapped off from the main bag tube along the weakened lines. The timing is such that the weakened or perforated portions are just past the feed rollers when the bottoming cylinder takes hold and severs the bag tube along the lines of weakening. However, in employing this process it is necessary that the bottom of the bag be folded in such a manner as to include both walls within the line of fold. In other words, both walls of the bag tube must be included within the clamp on the bottom forming cylinder. This necessitates the making of a bottom which is larger than the closing flap and not only is wasteful of paper, but produces a bag unsightly in appearance, especially when the closing flap is of substantial length as for instance, two inches, or more.

One of the objects of the present invention is the production of a bag by the general process above described, but without the necessity for including both walls of the bag tube within the bottom fold thereby not only saving considerable paper in the manufacture of each bag, but also producing a bag of much better appearance.

Another object of the invention is the production of a bag in which the side edges of the closing flap are smooth thereby adding to the appearance of the bag.

A further object of the invention is the production of a machine for carrying out my improved method while maintaining high speed of production.

The invention will be better understood by reference to the following description and claims when taken in connection with the accompanying drawings in which:

Figure 1 is a longitudinal section of a bag machine adapted to make bags according to my improved process.

Figure 2 is a plan view more or less diagrammatic showing the essential steps of the process.

Figure 3 is a top plan view of a portion of the rear of the machine and illustrating the manner in which the web is cut.

Figure 4 is a front view of the knives and cooperating cylinder for making cuts in the web which determine the side edges of the closing flap.

Figure 5 is a sectional view on an enlarged scale of the front portion of the machine shown in Figure 1 and illustrating how a bag tube section is severed from the main bag tube prior to closing the bottom of the bag tube section to form a finished bag.

Figure 6 is a perspective view of the rear portion of the machine and better illustrates the driving connections.

Figure 7 is a side elevation of a portion of the front of the machine showing the change gearing.

Figure 8 is a bag tube section prior to closing the bottom thereof; and

Figure 9 is a finished bag.

Referring to Figure 1 of the drawings, 2 indicates one of the side frames of the machine which frames support the operating mechanism. A roll of paper 4 is mounted on a shaft 5 supported from the machine frame. A web of paper 6 is drawn from the roll 4 and passes under and over idler rollers 7 and around a driven roller 8 and about an idler 10. At this point a line of paste is applied to one edge of the web indicated at 12, Figure 2, such paste being supplied by a disc 13 which dips into a paste pot 14.

The web 6 after passing over the roller 10 and having received a line of paste, passes about a roller 16 formed of rubber or similar material. As the web passes over this roller it is perforated at each side along the lines 17, the lines of perforation extending inwardly toward the center of the web. Between the ends of said perforations but offset therefrom the web is also perforated along the line 18, Figure 2. The perforations 17 are made by two aligned knives 20, the edges of which are discontinuous or serrated. The line of perforation 18 is made by a similarly constructed knife 19. Both of the knives 20 and the knife 19 are carried by a cylinder 21 which is positively driven as will be later described.

The knives 20 are circumferentially offset from the knife 19, the latter coming first into operation as the web is advanced through the machine.

After the web has passed over the rubber roller 16 and has been perforated or weakened along the lines 17, and along the line 18, it presents the appearance shown at section A, Figure 2. It then passes under an idler roller 22 and over a steel roller 23 where it receives the cuts 24 which cuts are diagonal in respect of the longitudinal line of the web. These cuts join the inner ends of the perforations 17 with the outer ends of the perforations 18 as clearly shown in Figure 2, section B. After receiving the cuts 24, the web passes under a roller 26 supported by an arm 27 carried by a shaft 28 suitably supported by a frame 29, the latter carried by the framework of the machine. The frame 29 carries at its lower portion the usual former 30 under which the web passes and about which it is wrapped to form a bag tube in the usual and well known manner common to bag machines. The folded tube is subjected to the action of rollers 31 which tend to smooth down the overlapped portions of the web and aid in drawing the tube more tightly about the former 30, as is likewise customary in machines of this character. The tube then passes between feed rollers 32 which are positively driven and act to pull the tube and web forward, aided somewhat by the positively driven roller 8.

After the web has been folded, the perforations 17 form a single line of perforations or weakened portions which will eventually constitute the top edge of the closing flap in one wall of a bag tube section, as indicated in Figures 2 and 8, as well as the bottom edge of the same tube wall.

The line of perforations 18 will eventually constitute the bottom and top of the other wall of a bag section as shown at Figure 2, section C, and in Figure 8. The cuts 24 will determine the side edges of the closing flap and also the side edges of the gussets which are formed at the bottom of a bag tube section.

The cuts 24 are produced by two knife edges 34 each supported in a block 35, Figures 1, 3, and 6, said blocks being carried on a shaft 36 which is positively driven as will be later described. The blocks 35 are adjustable along the shaft 36 and are so constructed that they may carry a knife at diametrically opposite portions thereof. A pair of knives are used in each block when a bag of one-half the length of the one illustrated, is to be made.

These knives 34 may be of the character shown in Figures 6, 7, and 8 of my Reissue Patent 19,921 and described in detail therein. Instead of having a continuous edge, however, as shown and described in said reissue patent, these knives may have their edges interrupted as shown and described in my Patent 2,030,118 (see Figures 3 and 4).

Preferably where the closing flap of the bag is of medium length, not exceeding two inches, for example, the continuous edge knife would be used. Where the closing flap is longer it may be desirable to use the type of knife edge illustrated in said Patent 2,030,118 for the reasons stated in said patent.

In the Potdevin Patent 1,941,272 previously referred to, the side edges of the closing flap are formed by serrated edge knives 5 and 7 shown in Figure 2 of said patent. It is of course obvious that such perforators as described in said Potdevin patent may be used in the present case. However, there are several objections to perforating the web in the manner there illustrated. The serrated edge knives 19 and 20 shown in Figure 3 of the present application and corresponding to the knives 4, 6, and 8 of the Potdevin patent must cooperate with a roller of yielding material, such as rubber. I have found in practice that when serrated edge cutters are used in connection with such rubber roller to determine the side edges of the closing flap, very shortly grooves are formed in the rubber roller and that then the perforations are not sufficiently deep to enable the bag sections to be properly severed from the main tube. It is then necessary to substitute a new roller corresponding to the roller 3, Figure 2 of the Potdevin patent, when such method is used.

With my improved method and apparatus wherein the preliminary cutting of the web is performed in two stages, not only are the objectionable grooves eliminated, but the side edges of the closing flap may be made smoother.

In the present machine the roller 23 is of steel and therefore is subject to very slight wear.

After the tube has been folded as described, and the folded tube has progressed to the position shown at section C, Figure 2, the next operation consists in completely severing a bag tube section from the main bag tube to produce separate bag sections which may be suitably bottomed to produce a complete bag.

In the present invention a bag tube section is severed from the main bag tube by means shown more clearly in Figure 5.

A shaft 38 is carried by a frame 39 which is supported on the main frame of the machine. By means which will be described more in detail hereinafter, the shaft 38 is positively driven. A sector block 40 is carried by said shaft and is cir-

cumferentially adjustable thereon. A pinch bar 42 may be mounted at diametrically opposite positions on said sector block 40 although but one such bar is shown in Figure 5 for making the bag length illustrated.

The connections are such that the surface speed of the pinch bar 42 is greater than the surface speed of the feed rollers 32. The timing is such that the bag tube is pinched between the pinch bar 42 and a cooperating roller 44 just after the cuts or weakened portions of the bag tube pass the feed rollers 32. The pinch bar, therefore, by reason of its greater surface speed operates to snap a bag tube section from the main tube along the lines of weakened portions thereof while the main tube is being held by the feed rollers 32. Figure 5 shows clearly a bag tube section as having been separated from the main bag tube and this is also shown in Figure 2, section D. The severed bag tube section is then passed to the bottoming mechanism which pastes and folds the bottom of the bag, the section being supported in its travel after leaving the pinch bar mechanism by a transversely extending plate 45. The frame 39 is adjustable along the machine bed to properly position the pinch bar mechanism for bags of different lengths.

The bottoming mechanism is generally of well known construction, but in order to make the disclosure complete, said mechanism will be briefly described.

A cylinder 46 is supported on a shaft 47, said cylinder carrying a paste bar 48 running longitudinally of the cylinder. It is secured by screws to a bar 49 as is usual in machines of this type. The bar 49 is moved in and out a short distance by a cam shown in dotted lines at 50, Figure 5, said cam engaging a roller 51 carried by a bell crank 52 mounted on shaft 53 supported in the cylinder 46. The other end of the bell crank engages a roller 54 carried by the bar 49. This bar is normally urged in a radial direction to project the paste bar beyond the circumference of the cylinder 46, but the action of this spring is resisted by the cam 50 which is of such contour that the paste bar is withdrawn to substantial coincidence with the surface of the cylinder 46 as the paste bar approaches the position to apply the paste to the bag tube, this withdrawal being necessary to prevent interference of the paste bar with the lower cylinder. However, after the cylinder 46 has rotated sufficiently to take the paste bar out of the zone of the paper, the cam 50 permits the springs 56 to project the paste bar to a position to contact with the paste applying roller 58 rotatable in a recess in a paste pot 59. In the present case the cylinder 46 is arranged to support two paste bar mechanisms, both however operating as above described.

The cylinder 46 also carries a tucker blade 60 and may carry another such blade at a diametrically opposite position. For making the length of bag shown, however, but one tucker blade is used. This blade cooperates with a clamp 61 in the bottoming cylinder 62. This cylinder may carry four clamps, all four of which may be used for making a short bag. If the bag length exceeds a certain length, only two clamps are used as will be later described. Each clamp is carried by a rod 64. This rod is provided with an arm 65 carrying a roller 66 engaging a cam 67 which causes the clamp to open in proper timed relation with the position of the cylinder 62, to deliver a completed bag as shown at the left in Figure 1. An arm 68 carried by the rod 64 has connected to it a spring 69 which causes the clamp to close when permitted by the cam 67.

The complete severance of a bag tube section from the main bag tube by the pinch bar 42 prior to bottoming a bag tube section, is an important feature of the present invention and enables a bag to be produced having a small bottom without waste of paper. The importance of this feature will be better understood by reference to methods heretofore used for completely severing a bag tube section from the main tube along lines of perforations or weakened portions previously made in a web or tube. In accordance with methods previously employed, the snapping off has been effected by the clamp cylinder. In bag machines this clamp cylinder always rotates at a higher peripheral speed than the feed rollers and it has been heretofore proposed to pass the weakened bag tube directly from the feed rollers to the clamp cylinder which did the severing. It is necessary, however, that both walls of the bag tube be held during such severance and therefore when the clamp cylinder is used to snap off a bag tube section, it is necessary that both walls of the tube be tucked into the clamp in order that such severance may be possible.

By the method of the present invention, however, the severance of a bag tube section from the main bag tube is brought about by the pinch bar mechanism and not by the clamp cylinder. During the action of the pinch bar mechanism, the pinch bar 42 engages the bag tube in such a position as to always pinch both walls of the tube against the roller 44 thereby completely severing a bag section prior to the feeding of the severed section to the bottoming cylinder. Just as the pinch bar is about to let go of the severed bag tube section, the tucker blade 60 begins to push the bottom portion of the bag into the clamp 61 but such folding includes but one bag wall. In other words the line of fold is along the line *a—a*, Figure 8. Consequently the bag made according to my improved method contains a much smaller bottom than is possible with the method previously referred to. The saving of paper amounts to approximately 7%. This becomes an extremely important item when it is remembered that a machine such as I have described is capable of producing upwards of 300,000 bags per working day of eight hours. Not only is this saving of paper effected, but the appearance of the bag is greatly enhanced by reason of the small bottom in proportion to the length of the bag.

The various mechanisms of the machine derive their motion from a shaft 71, Figure 1. This shaft may be driven in any suitable way either directly by a motor or by overhead shafting in which case the shaft 71 would be provided with a pulley on the end opposite to that shown in Figure 1. A bevelled gear 72 carried by said shaft 71 meshes with a similar gear 73 on a shaft 74 running to a transmission casing 75 (see also Figure 6). A stud shaft projects from the lower portion of said casing and is provided with a bevelled gear 76 meshing with a similar gear 77 on a shaft 78, the latter shaft carrying a sprocket 79. A sprocket chain conveys motion from the shaft 78 to the mechanism in the rear of the machine. The sprocket chain passes about said sprocket 79 and about a sprocket carried by a shaft 80 whereby the latter shaft is positively driven. The sprocket chain is suitably guided over intermediate idlers 80*a* and 80*b*, the latter being mounted

on an arm whereby the tension of the sprocket chain may be adjusted.

The shaft 80 carries thereon a small gear 81 and a larger gear 82. The gear 81 meshes with an idler gear 83 carried by stud shaft (Figure 6), said gear 83 in turn meshing with a gear 84 on the shaft carrying the roller 8 whereby said roller is positively driven and aids the feed rollers 32 in pulling the web through the machine.

The larger gear 82 carried by the shaft 80 meshes with an adjustable idler gear 85 carried by a stud shaft 86, said gear 85 meshing in turn with a gear 87 secured to the shaft 88 upon which is mounted the roller 21 supporting the cutters 19 and 20. The stud shaft 86 and the shaft 88 are both adjustable for a purpose which will later be explained.

The shaft 36 carrying the knives 34 derives its motion from the gear 87 through means of gears 89, 90, 91, and 92, the latter gear being secured to the shaft 36.

By the means above described, the shaft carrying the roller 8, the shaft 88 carrying the cutters 19 and 20, and the shaft 36 are all positively driven in the proper direction. The various shafts and gears are mounted in an upper frame which is adjustable along the machine bed in order to permit bags of different lengths to be conveniently made. The adjustment is effected by means of bolts 93 operating in T-slots 94 shown in dotted lines, Figure 1.

The mechanism at the front of the machine also derives its motion from the shaft 71 and for this purpose said shaft carries a gear 96 shown in dotted lines, Figure 1, which gear meshes with a gear 98 carried by shaft 97 on which the clamp cylinder 62 is mounted.

The feed rollers 32 are driven from the shaft 97 through change gear mechanism. For this purpose the shaft 97 carries a gear 99 (see Figure 7) somewhat smaller than the gear 98. Said gear 99 meshes with a gear 100 carried by a stud shaft 101. The gear 100 in turn engages a gear 102 on shaft 103, which is the lower feed roller shaft. Gear 102 meshes with gear 104 on the upper feed roller shaft 105. The change gearing above described is provided in order that the feed rollers may be driven at different peripheral speeds in relation to the clamp cylinder 62. The gear 99 mounted on the shaft 97 may be removed and a gear containing a different number of teeth substituted to change the ratio of transmission between the clamp cylinder and the feed rollers. To this end also the stud shaft 101 is carried by a bracket 106 which pivots about the shaft 103 and may be secured in its different adjusted positions along a slot 108 in the bracket. The bracket 106 is also provided with a slot 109 along which the stud shaft 101 may be adjusted and properly clamped in its various adjusted positions.

The pinch bar mechanism is driven directly from the clamp cylinder 62 and for this purpose a pinion 112 engages the gear 98 and also the gear 114 carried by a shaft 116 which supports the roller 44. The pinch bar shaft 38 carries a gear 118 meshing with the gear 114. By this train of gears the pinch bar is driven at the same peripheral speed as the clamp cylinder and both are always driven at a higher peripheral speed than the feed rollers.

The clamp cylinder is geared to the cylinder 46 carrying the tucker blade 60 in a two to one ratio and this ratio also exists between the clamp cylinder and the pinch bar shaft 38. As illustrated in the drawings and using one pinch bar 42 and one tucker blade 60, two complete bags would be made at each single rotation of the clamp cylinder 62. The pinch bar however, and the cylinder 46 make two rotations as do likewise the cylinder 21 and the knife shaft 36.

It will be recalled that the block 35 may have a knife 34 at diametrically opposite ends thereof so that with each rotation of the shaft 36 two pairs of slits would be made in the web. Likewise the cylinder 21 instead of having a single pair of cutters 19 and a single cutter 20 may have duplicate sets of these at diametrically opposite positions thereby making two sets of perforations for each single rotation of the roller 21. It will be obvious, however, that with this arrangement, the bag length would be only one-half of that shown in the drawings. It would also be necessary to use two pinch bars 42 and two tucker blades 60 and also two paste bars. The length of such a bag would necessarily have to be shorter than the circumferential distance between two adjacent clamps on the cylinder 62. In making the shorter bag all four clamps would be used.

If the bag length is longer than the circumferential distance between two adjacent clamps on the cylinder 62, which is the condition actually shown in the drawings, a single tucker blade 60 is used which cooperates with every other clamp 61 on the cylinder 62.

To make a bag of different length than the one shown in the drawings, it is necessary to change the ratio of drive between the clamp cylinder and the feed rollers 32 and this change is made by taking off the gear 99, Figure 7, and substituting a gear having a different number of teeth. It is not necessary in such case, however, to make any change in the pinch bar mechanism or the tucker blade cylinder. It is necessary, however, to make a change in the rear portion of the machine because the shafts 88 and 36 must be driven once for each bag or each two bags and hence the shaft carrying the idler gear 91 is made adjustable so that a different size gear may be used for a different bag length. This is likewise true of the shaft 88 and the shaft 86 carrying the idler 85. In the making of a longer bar than the one shown, the cylinder 21 would have to be replaced by a cylinder of larger diameter so that during one rotation of said cylinder, the knives 19 and 20 would make their cuts at the proper distance apart to determine the longer bag tube section.

The knives 34 must also be changed and knives of the proper radius of curvature substituted.

What I claim is:

1. The method of making bags without waste of material which consists in producing generally longitudinal and transverse cuts or weakened lines at regular intervals in a continuously advancing web, which cuts do not completely sever the web, so folding the web as to form a bag tube having upper and lower walls with said cuts defining a bag tube section, producing an acceleration in the direction of advance of the web of successive bag sections to completely sever a section from the bag tube along lines as defined by said cuts to provide a flap at each end of a bag tube section, and thereafter folding one of said flaps over the bottom of a bag tube section to close the same, said fold including but one bag wall.

2. In a bag machine, the combination with a former about which a web of paper is wrapped to

form a bag tube, and feed rollers for advancing the tube; of means for perforating the web prior to folding thereof along lines which define a bag tube section after the web is folded, pinch bar mechanism operated at a greater peripheral speed than the feed rollers and acting to separate successive bag sections from the main tube, and means for subsequently bottoming the bag tube sections, said pinch bar mechanism acting to feed a severed bag section directly to the bottoming mechanism.

3. In a bag machine, the combination with a former about which a web of paper is wrapped to form a bag tube and feed rollers for advancing the tube; of means for perforating the web prior to folding, along lines which define a bag tube section after the web is folded, pinch bar mechanism operating at a greater peripheral speed than the feed rollers and acting to separate successive bag sections from the main tube, and bottoming means for folding the bottom of each bag section along a line which includes one wall only of a bag tube section, said pinch bar mechanism acting to feed a severed bag section directly to the bottoming mechanism.

4. The method of making bags without waste of material which consists in producing two series of cuts in a continuously advancing web, the two series being in transverse alignment but separated transversely, forming a third series of transverse cuts located between the inner ends of the two series of cuts but off-set therefrom in a longitudinal direction of the web, thereafter making cuts which join the outer ends of the third series of cuts with the inner ends of the first two series of cuts, which latter cuts do not completely sever the web, so folding the web as to form a bag tube having upper and lower walls with said cuts defining a bag tube section, producing an acceleration in the direction of the advance of the web of successive bag tube sections to completely sever a section from the bag tube along lines as defined by said cuts to produce a flap at each end of a bag tube section and thereafter folding one of said flaps over the bottom of a bag tube section to close the same, said fold including but one bag wall.

5. The method of making a bag from a bag tube section, said section having a bottom flap and a top closing flap which method consists in producing two series of interrupted cuts in a continuously advancing web, the two series being in transverse alignment but separated transversely, forming a third series of interrupted transverse cuts located between the inner ends of the two series of cuts but offset therefrom in a longitudinal direction of the web, connecting the outer ends of the third series of cuts with the inner ends of the first two series by continuous cuts which latter cuts define the side edges of the closing flap of the finished bag, folding the web to form a bag tube, completely severing the tube into a bag section as defined by said cuts to produce a flap at each end of a bag tube section and thereafter folding one of said flaps over the bottom of the bag tube section to close the same, said fold including but one bag wall.

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