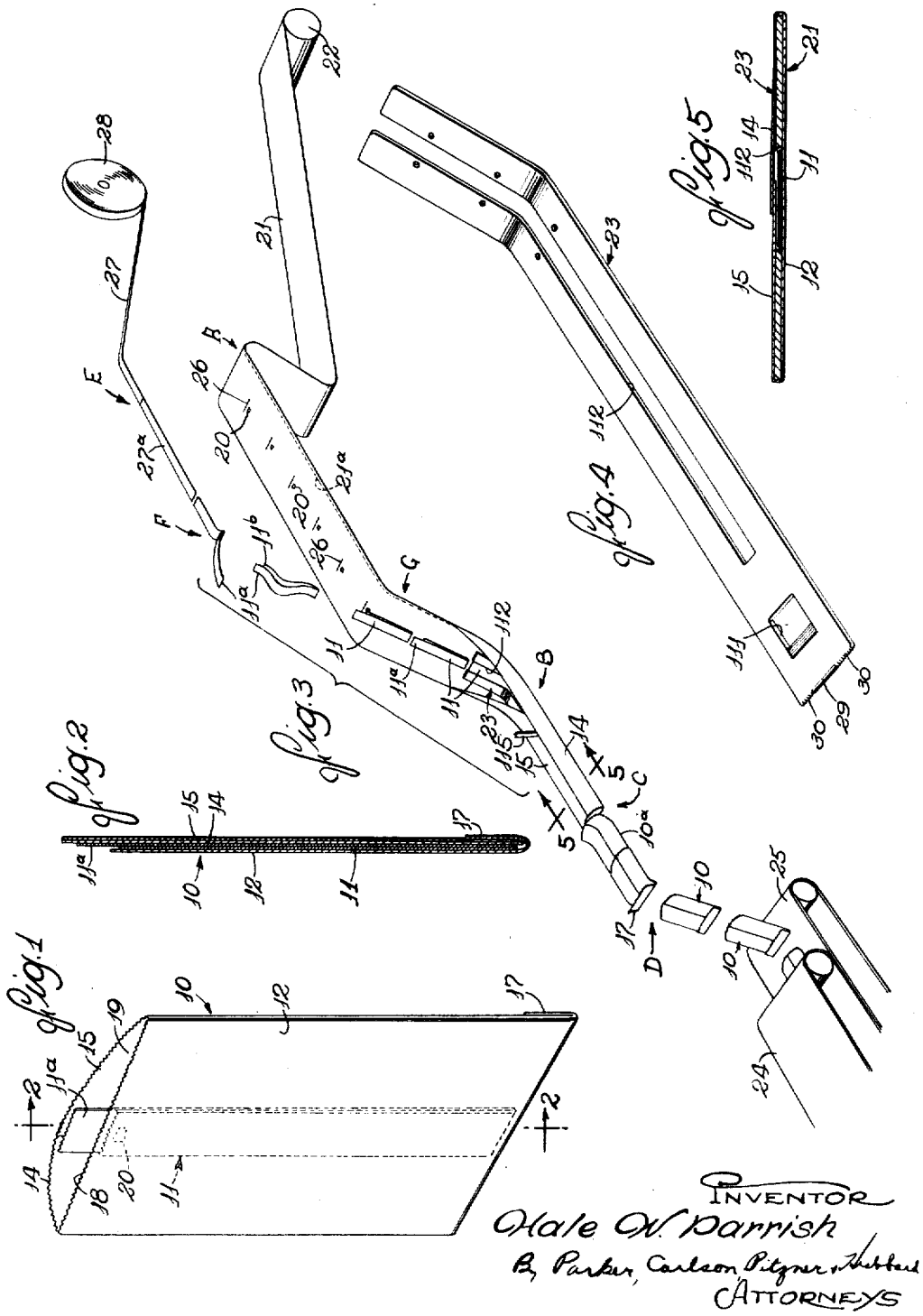
July 8, 1941. H. W. PARRISH 2,248,895

BAG MAKING MACHINE AND METHOD

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BAG MAKING MACHINE AND METHOD

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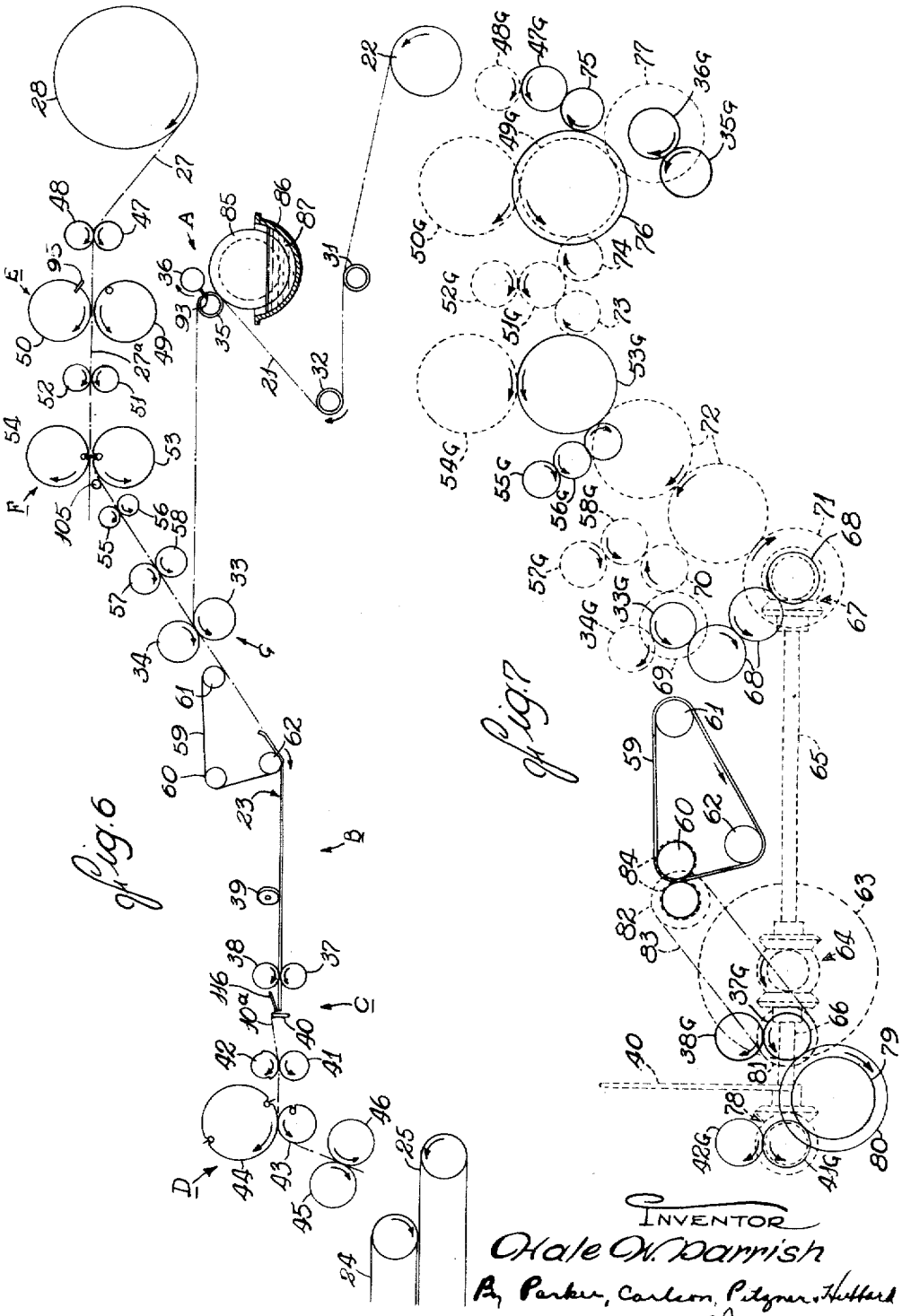


Fig. 6

Fig. 7

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BAG MAKING MACHINE AND METHOD

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Fig. 8

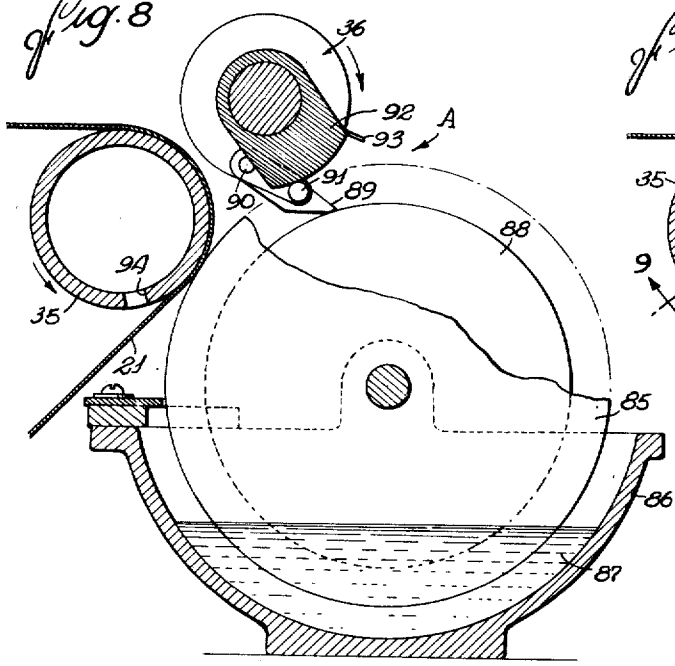


Fig. 8a

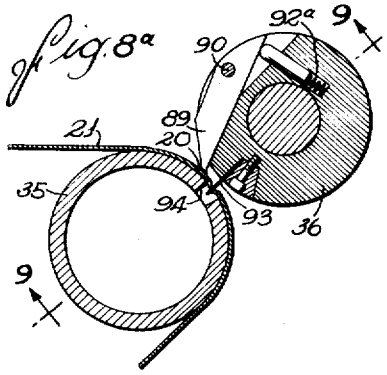


Fig. 9

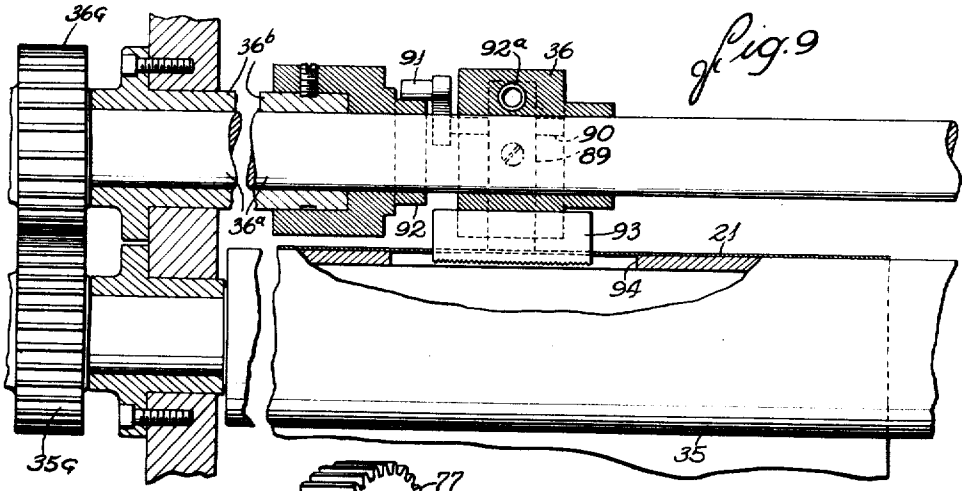
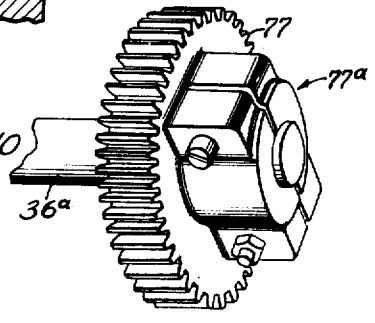


Fig. 10



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Fig. 11

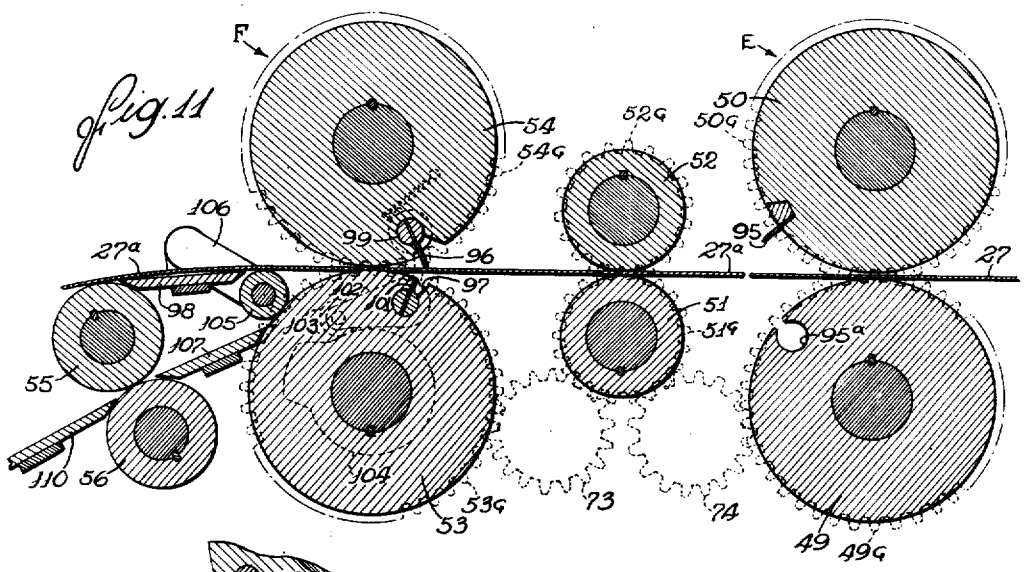


Fig. 11a

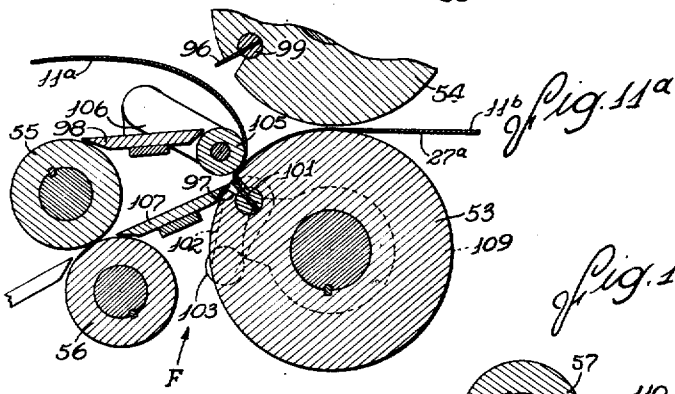


Fig. 12

Fig. 13

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Fig. 14

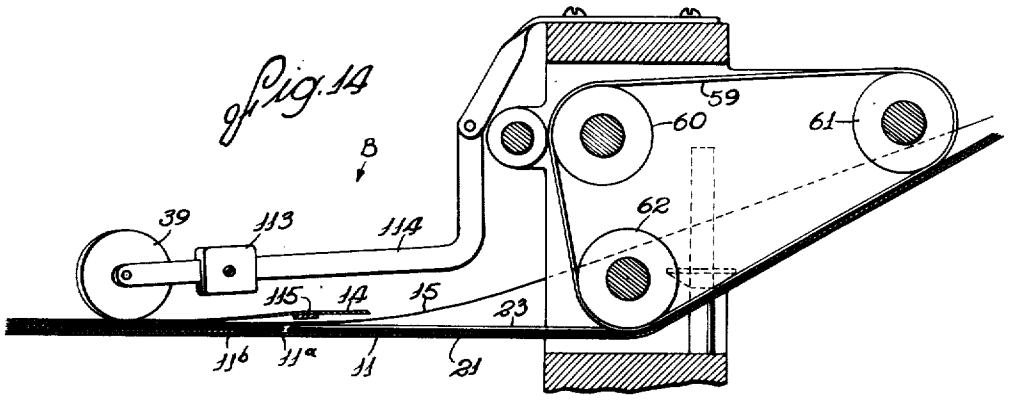


Fig. 15

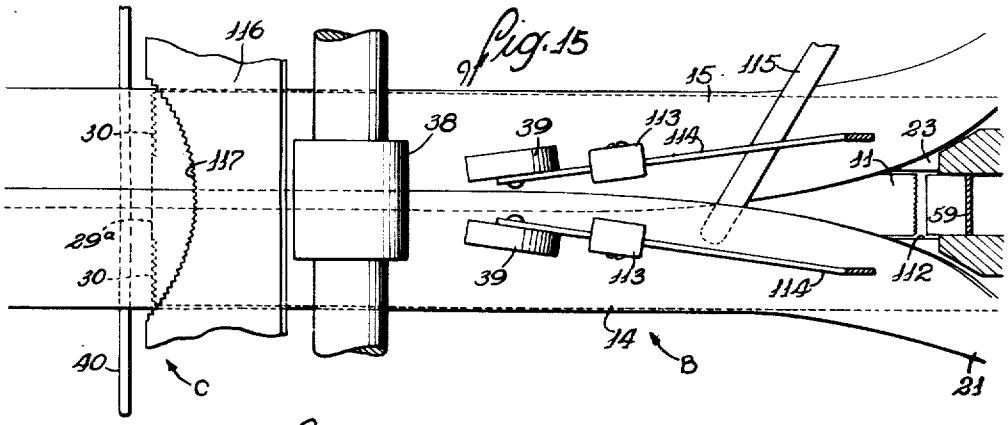


Fig. 16

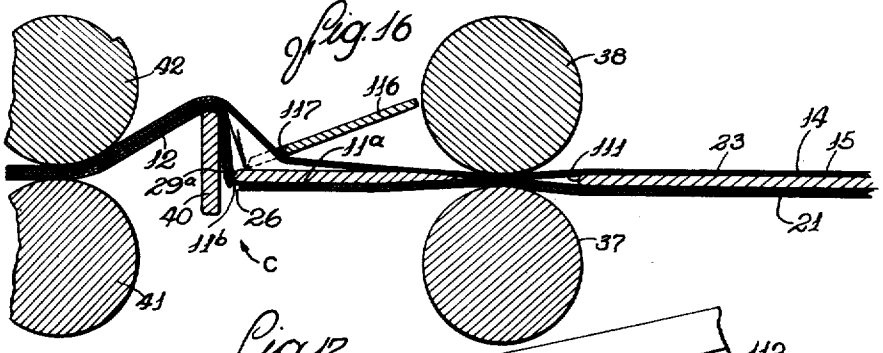
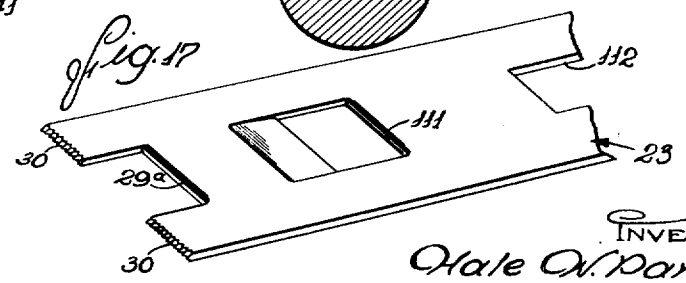


Fig. 17



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UNITED STATES PATENT OFFICE

2,248,895

BAG MAKING MACHINE AND METHOD

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Application May 29, 1939, Serial No. 276,324

20 Claims. (Cl. 93—8)

The invention relates to a method and machine for bag making, and more particularly for making bags with interiorly located lifting strips.

Bags of this character are especially handy as sanitary containers for foods as, for example, sandwiches. For this purpose, the bag may be made of any suitable material such as plain paper, wax paper, Cellophane, or the like. The lifting strip may also be made of paper and in the form of a strip doubled upon itself. One end of the strip is attached to the bag near its mouth and extends down into the bag with the fold of the strip at the bag bottom and the free end of the strip projecting from the bag mouth. When so located, the strip embraces the bag contents, and by pulling on the free end of the strip the contents may be gradually moved out of the mouth of the bag.

The general object of the present invention is to provide a novel method and machine by which bags with interiorly located lifting strips may be made at high speed and at very low cost.

A more specific object of the invention is to provide a method and machine for making bags of the type described, characterized by the initial attachment of the folded lifting strips to an advancing sheet of bag material and subsequent folding of the sheet about the strips in bag body form so that a lifting strip is located on the inside of each bag when the latter are completed.

A further object is to form the lifting strips from a roll of ribbon advanced in synchronism with the sheet from which the bags are formed.

Another object is to provide a method and apparatus for making bags of the type indicated, of such character that the bags may be formed by transversely severing a tubular piece of bag material at successive points without also severing lifting strips located within the tube and extending across the line of transverse severance. In this way an end of the strip is left projecting from the mouth of the completed bag in position to be readily gripped by a user.

The invention also resides in various structural improvements in the machine by means of which the bag-forming, strip-forming and strip-attaching operations are all accurately correlated and synchronized.

Further objects and advantages of the invention will become apparent as the following description proceeds, taken in connection with the accompanying drawings, in which

Figure 1 is a perspective view of a finished bag with attached lifting strip, made in accordance with the method and by the machine herein disclosed.

Fig. 2 is a vertical sectional view along the line 2—2 in Fig. 1.

Fig. 3 is a generally schematic perspective view showing the progress of the materials as they are formed into lifting strip bags like that of Fig. 1.

Fig. 4 is a detail perspective view of a forming plate utilized in the bag forming machine.

Fig. 5 is an enlarged transverse sectional view along the line 5—5 of Fig. 3.

Fig. 6 is a schematic side elevation of a bag making machine embodying the invention.

Fig. 7 is a diagrammatic layout of the gearing included in the drive mechanism for the machine of Fig. 6.

Fig. 8 is a side elevation, partly in vertical section, of the portion of the machine at station A in Fig. 6.

Fig. 8ª is a detail stop-motion view of a portion of the mechanism of Fig. 8.

Fig. 9 is an end elevation partly in section along the line 9—9 in Fig. 8ª of a portion of the mechanism of Fig. 8.

Fig. 10 is a detail perspective view of one of the driving gears showing its micrometer adjustment mounting.

Fig. 11 is a side elevation of the apparatus included at stations E and F in the machine of Fig. 6.

Fig. 11ª is a stop-motion view of the apparatus at station F shown in Fig. 11.

Fig. 12 is a side elevation of the apparatus included in the machine of Fig. 6 between stations F and G.

Fig. 13 is a detail perspective view of part of the apparatus included at station F, as shown in Fig. 11.

Fig. 14 is a side elevation, partly in vertical section, of the apparatus included in the machine of Fig. 6 at station B.

Figs. 15 and 16 are respectively plan and side elevations of the apparatus at station C in the machine of Fig. 6.

Fig. 17 is a fragmentary perspective view of a modified forming plate adapted to replace that of Fig. 4 in the machine of Fig. 6.

The invention is exemplified herein as applied to the making of bags 10 each having a folded and interiorly located lifting strip 11. This particular bag is of flat form with a plain, unseamed front wall 12 and a back wall formed by overlapping portions 14—15 adhesively secured together to form a longitudinal seam. The bottom of the bag is closed by doubling the bag upon

itself at 17 and securing the folded end in place by adhesive. The open upper end or mouth 18 of the bag may be closed by a flap 19, which constitutes an extension on the rear wall. The lifting strip 11 is secured near the open end of the bag to the inner side of the front wall 12 by adhesive 20, and the free end 11a of the strip projects beyond the short front wall but short of the end 19 of the rear wall, being readily accessible at the open end of the bag.

It will be understood that the present invention is applicable to the manufacture of a large variety of other forms of lifting strip bags. Consequently, even though a particular application of the invention has been shown and described in some detail, there is no intention to thereby limit the invention to such application, but, on the other hand, the appended claims are intended to cover all alternative applications, methods and constructions falling within the spirit and scope of the invention.

Briefly stated, the method herein contemplated includes the steps of advancing a continuous sheet of paper or other bag material in an endwise direction, attaching a folded lifting strip to the advancing sheet, folding the sheet about the strip to form a bag body, and then severing the folded sheet to complete the bag. By first locating the strip on the sheet and then folding it about the strip, the latter is properly located in the interior of the completed bag. Furthermore, this method is particularly well adapted to be carried out by an automatic machine operating at very high speed since successive strips may be formed from a continuously advancing ribbon and attached to the bag sheet while the latter is in motion and without interference with any of the bag-forming steps.

In the illustrative application of the method herein disclosed (see Fig. 3), the bags 10 are formed from a sheet of paper 21 unreeled continuously from a supply roll 22. In general, the manipulation of the sheet 21 is that commonly used in making flat paper bags and, consequently, a detailed description of the machinery for accomplishing it is believed to be unnecessary. In brief, the advancing sheet 21 first passes through station A where adhesive is applied along its side edge 21a for subsequent completion of the longitudinal bag seam. Then, the sheet passes beneath an angular forming plate 23 (see also Fig. 4) at station B. The side edge portions 14 and 15 are progressively folded in over the forming plate 23 and their overlapping edges are pressed together so that the sheet is glued in tubular configuration. Next the tube is severed transversely at station C into successive sections 10a. Finally, the bottoms 17 of these sections are folded at station D to complete the bags 10, the finished bags being carried away by the conveyor belts 24, 25.

In addition to the usual bag forming steps outlined above, two other or new operations are performed on the advancing sheet 21, preferably at station A, to condition it for receiving the lifting strips 11. These are respectively the cutting of the sheet to form transversely extending slits 26 at points spaced longitudinally of the strips to correspond to the upper ends of the rear walls of successive bags and the application of dabs of glue or other adhesive 20 at points slightly in advance of each of the slits 26. These spots of glue secure the short ends 11b of the subsequently applied lifting strips 11 on the sheet. The slits 26 serve to prevent tearing of the projecting tab ends 11a of the strips when the bag sections are severed at station C, as will hereinafter appear more fully.

The lifting strips 11 are also formed from a continuous length of material, in this case a ribbon of paper 27 (Fig. 3) unrolled from a supply spool 28. As this ribbon advances, it is cut into separate lengths 27a at station E, which sections are doubled or folded upon themselves at station F to form the finished lifting strips 11 which advance with their short ends 11b facing the sheet 21. The paths of the advancing bag material 21 and strips 11 merge at station G where the strips are fed onto the sheet at a rate exactly matched with the latter's rate of advance. The shorter portion 11b of each successive strip 11 is pressed against a corresponding spot 20 of adhesive and located with the free end of the longer strip leg projecting across the center slit 26. After the lifting strips 11 have been glued to the sheet 21 in this manner at station G, the formation of the bags 10 is continued as described above, the sheet 21 being folded about the strips 11 in the form of a bag body with the strips located inside the same.

The severing of the separate bag sections 10a (Fig. 3) from the tubularly folded material 21 is preferably accomplished by a tearing operation. The lower side of the tube (as viewed in Fig. 3) can, for example, be torn transversely by pulling it sharply up against the trailing end edge of the forming plate 23. The difficulty is, however, that this tearing must be accomplished without also tearing off the end 11a of the lifting strip which projects beyond the mouth of the bag. It is to meet this difficulty that the preliminary center cuts 26 are made in the sheet. With the sheet 21 so cut the severance of the tube bottom wall can be completed by tearing this wall along transverse lines merging with the ends of the slits 26 while not applying any substantial tearing force at the center of the sheet where the lifting strips 11 are located. For this purpose the lower end of the forming plate 23 is fashioned with a smoothly rounded center portion 29 (Fig. 4) matching in length the center slits 26. At each side of the portion 29 cutting edges are fashioned in the form of sharp teeth 30. With the end of the forming plate so shaped the bottom of the tubular material folded about it can be pulled upward, as, for example, in the usual manner of tearing a piece of paper along a straight edge, and it will be torn in two spaced lines merging with the ends of the center slits 26. The projecting ends 11a of the lifting strips ride up over the rounded center section 29 during this operation without being torn or harmed. It will be apparent, however, that in order for the operation to be carried out successfully, the center slits 26 must be located accurately in registry with the end of the forming plate 23 when the tearing operation is carried out. The machine herein disclosed is particularly adapted to accomplish the nicety of timing required for this purpose.

An important advantage of the method described above is its adaptability to high speed production. The improved machine herein disclosed may be advantageously utilized in carrying out this method. In many respects, this machine resembles those heretofore used in making flat paper bags without lifting strips. Accordingly, the succeeding description and drawings are directed particularly to those parts of the machine which are new in character and es-

pecially adapted to the manufacture of bags with interiorly located lifting strips.

For an understanding of the general layout of the illustrative machine embodying the invention and adapted to carry out the method described above, reference should be had to the diagrammatic view in Fig. 6. In this machine, the paper sheet 21 is led from the roll 22 over freely revoluble guide rollers 31, 32, then through station A, and thence between a pair of opposed power-driven friction guide rollers 33, 34 at station G which bear lightly on the paper sheet 21. At station A, the sheet 21 passes over a power driven roller 35, which cooperates with an opposed roller 36 to form the center slits 26 and apply the spots of adhesive 20 (see Fig. 3) in a manner hereinafter described. Also, at this station a roller 85, running in a bath of liquid adhesive 87, applies adhesive along the side edge 21^a of the sheet (see Fig. 3). After leaving the guide rollers 33—34, the sheet 21 is drawn along the former plate 23 by a pair of power driven draw rolls 37 and 38 which are adjusted to provide sufficient friction for pulling the sheet 21 through the machine. The draw rolls 37 and 38 establish the feed rate of the paper sheet 21 and the other rolls are adjusted to rotate in synchronism therewith. As a result of the tension exerted on the paper sheet 21 by the rolls 37 and 38, the side edges of the sheet are folded in about the former plate, being pressed down and pulled together by draw-in rollers 39 (see also Fig. 15). At station C, the sheet, then in tubular form, is severed into its successive sections 10^a by a striker bar 40 which is revolved in a vertical plane transverse to the path of movement of the bag material. Thereafter, the sections 10^a are fed by a pair of feed rollers 41—42 into the usual mechanism at station D for folding the bottoms 17 of the bags and including a pair of opposing rollers 43—44. Finally, the finished bags are advanced by feed rollers 45—46 onto the top of the conveyor belt 25.

Turning now to the mechanism for forming and applying the lifting strips 11, it will be noted that the unreeling of the paper 27 from the spool 28 is accomplished by a pair of opposed power actuated feed rollers 47—48 Fig. 6). These feed the ribbon 27 at a speed substantially twice that of the sheet 21 since a piece of ribbon substantially twice the length of a bag section must be provided to form the lifting strip for each bag. After leaving the feed rollers 47—48, the paper ribbon 27 passes through a severing mechanism at station E embodying a pair of opposed rollers 49—50, one of which carries a severing blade 95, thence through a second set of feed rollers 51—52 to a strip folding mechanism at station F. This folding mechanism also embodies a pair of opposed rollers 53—54 carrying suitable tucking or folding devices hereinafter described. Upon leaving the folding mechanism at station F, the lifting strips 11 are still advancing at a speed substantially twice that of the sheet 21. Their speeds must, however, be synchronized when their paths merge at station G where the strips are attached to the sheet of bag material. Accordingly, the rate of advance of the lifting strips 11 is slowed down between stations F and G by passing them through successive sets of "slow-down" rollers 55—56 and 57—58, which are driven at successively slower speeds. The lifting strips 11, as well as the sheet 21, are passed between the feed rolls 33—34 at station G and at this point the lifting strips are pressed against the spots 20 of adhesive on the sheet of bag material 21. Then, to hold the freshly applied lifting strips in position they are pressed against the sheet 21 by a flexible belt 59, made of canvas or the like, which is led over pulleys 60, 61, and 62.

To insure proper relative timing of the various parts of the machine, all are preferably driven through suitable gear trains from a single source of power such as an electric motor (not shown). In Fig. 7 the layout of the gearing has been shown diagrammatically. In this figure the circles indicate the pitch circles of the gears, those on the front of the machine being shown in full lines and those on the back in dotted lines. Of course, in some instances, a gear on the front of the machine covers a gear of the same diameter on the back of the machine. To facilitate an understanding of the relation of the gearing of Fig. 7 to the associated rollers, etc. in Fig. 6, the gears of Fig. 7 which are fast on rollers of Fig. 6 have been given the same reference numeral with the designating letter "G" added. For example, the gears on the main feed rollers 33, 34 (in Fig. 6) are designated in Fig. 7 as 33G and 34G.

Power is supplied to a drive pulley 63 (Fig. 7) which is connected through bevel gears 64 with two alined drive shafts 65 and 66. These shafts respectively drive the parts of the machine on the right and left hand sides of station B. Thus, the first drive shaft 65 is connected through bevel gears 67 and intermediate gears 68 with the guide roller gear 33G, which is in turn connected to a gear in mesh with the second guide roller gear 34G. The feed roller gears 57G and 58G are driven at a somewhat higher speed than the feed roller gears 33G, 34G from a gear 69 (fast with the gear 33G) through an intermediate gear 70. Also driven by the bevel gears 67 on the drive shaft 65 is an intermediate gear 71 which, through intermediate gears 72, drives the tucking roller gears 53G and 54G. Passing on down the machine, feed roller gears 51G, 52G are driven through an idler 73 while a second idler 74 meshes with one of the severing roller gears 49G which in turn meshes with its complemental roller gear 50G. The feed roller gears 47G, 48G are driven through an idler 75 from an intermediate gear 76 fast on the roller gear 49G. This latter gear also meshes with an intermediate gear 77 fast on the roller gear 36G which in turn drives the complemental roller gear 35G.

At the left hand end of the machine (as viewed in Fig. 7) the second drive shaft 66 carries the rotating striker bar 40. Additionally, this shaft drives the feed roller gears 41G and 42G through a set of bevel gears 78. The gear 41G in turn meshes with an intermediate gear 79 fast on a second intermediate gear 80 which drives the draw roll gears 37G and 38G. A sprocket 81 fast on the gear 37G drives a second sprocket 82 through a chain 83, and this second sprocket is connected through gears 84 with the belt pulley 60. The bag-end folding rollers 43—44 and feed rollers 45—46 are of conventional construction and their drive gears have not been shown. They may, however, be driven from the shaft 66 by suitable connecting gearing.

Bearing in mind the general layout of the machine as described above, attention may now be given to a more detailed consideration of the particular mechanisms included at the different stations in the machine. The apparatus at station A (Fig. 8) includes, as was previously noted,

a pair of cooperating rollers 35 and 36. To apply adhesive along the edge 21ª of the sheet of bag material 21 (see Fig. 3) the usual glue applying roller 85 (Fig. 8) is utilized. This roller is journaled in the top of a pot 86 containing liquid adhesive 87 and is of an axial width equal to the width of the line of adhesive to be applied to the sheet 21. The roller 85 is revolved by frictional contact of the sheet 21 against it as the latter passes over the opposed roller 35.

A second glue roller 88, fast on the roller 85, but of smaller diameter to provide clearance for a knife 93 by which the slits 26 are formed, supplies adhesive from the pot 86 to an applicator finger 89 on the upper roller 36 and this finger in turn applies the dabs 20 of adhesive to the advancing sheet 21 at accurately spaced points. The knife 93 projects from the roller 36 beyond the point of glue application making it necessary to move the applicator finger 89 to contact the glue roller 88. For this purpose, the applicator finger 89 is pivoted on the roller 36 by pin 90 and a stop pin 91 on the applicator finger is urged by a spring 92ª into engagement with a fixed cam 92 secured to the stationary bearing sleeve 36ᵇ (Fig. 9). The pin 91 contacts and follows the profile of the cam 92 so that the finger is projected outwardly and contacts the roller 88 thereby picking up adhesive. As the pin 91 passes the cam, it is moved by the spring 92ª to the position shown in Fig. 8ª in which the finger is located for proper transfer of the adhesive to the traveling paper web 21. In this way the finger applies a spot of adhesive on the sheet once during each revolution of the roller 36. This latter roller also carries the knife or blade 93 located centrally of the sheet 21 and registerable with a slot 94 in the opposed roller 35. The blade 93 thus forms the center slits 26 in the advancing sheet at precisely spaced points. The length of the center slits 26 approximates the width of the strips 11. Minimization of the slit length is desirable since in that way maximum longitudinal tensile strength of the sheet is retained to resist rupture while being pulled through the machine.

At station E (Fig. 11) the advancing ribbon of paper 27 is severed into successive sections 27ª by the knife or blade 95 projecting from the periphery of the roller 50. A cooperating recess 95ª in the opposed roller 49 receives the end of the blade as it passes through the strip. The feed rollers 51—52 are located sufficiently close to the rollers 49—50 to grip each of the sections 27ª before it is severed from the continuous ribbon 27 and direct it between the tucking rollers 53—54 at station F.

At station F (Fig. 11) each successive strip section 27ª is folded or doubled upon itself to form a completed lifting strip 11. For this purpose a dull edged tucking blade or plate 96 extending longitudinally of the roller 54 is arranged to engage each successive strip section and tuck its mid-portion into a complemental recess 97 in the cooperating lower roller 53. The parts are so timed that each strip section is passed between the rollers 53—54 for a little more than half its length (more than half, so that the upper leg of the folded strip will be longer than the lower leg in the finished strip) before the tucking blade 96 contacts it and tucks it into the groove 97. The projecting end of the strip 27ª which has passed on between the rollers 53—54 is received temporarily on a guide plate 98. The tucking blade 96 is pivoted on a pin 99 in a V-shaped longitudinal groove 100 in the upper roller 54 and is spring-pressed toward the forward face of this groove so that it yieldably urges the paper strip into the tucking recess 97 in the lower roller 53.

To hold the portion of the strip 27ª that has been pressed into the tucking groove or recess 97, a pivoted gripper plate 101 is utilized. This plate extends longitudinally of the recess 97 and carries an arm 102 and a roller 103 (Figs. 11 and 13). The pivoted arm 102 is spring-pressed against a peripheral stationary cam 104 (Fig. 11), and this cam is contoured to hold the arm 102 raised, so that the gripper plate 101 is correspondingly lifted from the trailing face of the tucking recess 97, until the strip 27ª has been thrust into the recess 97 by the tucking plate 96. Thereafter, the recess in the top of the cam 104 permits the arm 102 to drop down so that the gripper plate 101 presses the folded center portion of the paper strip 27ª against the trailing face of the tucking recess 97. Consequently, continued rotation of the roller 53 draws the strip section on about the periphery of the roller to continue the folding action along the length of the strip (Fig. 11ª).

To release the folded strips from the lower tucking roller 53, the cam 104 is contoured to shift the gripper plate 101 to released position after the roller 53 reaches approximately the position shown in Fig. 11a. Thereupon, the resiliency of the paper tends to cause it to snap out of the tucking recess 97 so that it is received upon a downwardly inclined guide plate 107. To positively insure stripping of the folded paper from the roller 53 a plurality of fingers 108 (Fig. 13) are fashioned on the forward edge of the guide plate 107. These fingers project into peripheral grooves 109 on the roller 53 and thus force the folded nose of each strip of paper out of the tucking groove 97. To prevent slippage or stopping of the strip 27ª after release by the gripper plate 101 a roller 105 is arranged to press the paper strip against the periphery of the roller 53 (Figs. 11, 11ª and 13). This roller 105 is journaled on a pivoted arm 106 and is driven frictionally by the continuous end portions 53ª of the roller 53 which it contacts.

Upon being freed from the lower tucking roller 53 the folded strips 11 are directed to station G along a series of inclined guide plates 110 (Fig. 12). The "slow-down" sets of feed rollers 55—56 and 57—58 are arranged at intervals along this path so as to slow up the rate of advance of the folder strips 11. As was previously noted, the paper ribbon 27 from which the lifting strips are formed must initially be fed at a rate substantially twice that of the bag material sheet 21 but after the strips are formed they must be slowed down so that their rate of advance matches that of the sheet of bag material. In the present machine this is done by feeding the strips through the successive pairs of slow-down rollers which are operated at successively slower speeds. It is desirable to use a plurality of such sets of slow-down rollers so as to minimize the resultant buckling of the advancing strips between each successive pair.

On reaching the guide rollers 33—34 at station G (Fig. 2) the strips 11 are pressed by these rollers against the face of the advancing sheet 21. At this point, the rates of sheet and strip advance are exactly synchronized since both the strips and the sheet pass through this same set of rollers. By timing the slow-up rollers (through the medium of their gear drives heretofore

described) the delivery of the strips 11 onto the sheet 21 is so timed that each strip will be accurately located on the sheet with its short underside leg overlying a spot of adhesive 20 and its longer upper leg overlying a center slit 26 in the sheet 21 (see also Fig. 3). In passing through the guide rollers 33—34, the strips 11 are pressed against the sheet 21 so as to cause the strips to be firmly glued in place. Incidentally, it should be noted that the side edge portion 21a (see Fig. 3) of the sheet 21 to which glue has been previously applied for the bag seam is located beyond the end of the upper roller 34 so that this glue will not smear the roller.

By forming the strips 11 in timed relation with the advance of the sheet 21, the manipulation of these strips is greatly simplified. When utilizing this arrangement it is unnecessary to provide any intermediate storage space for the strips prior to their delivery to the sheet and also any problem of segregating or picking these strips out of a stored batch of them is obviated.

After the strips 11 have been attached to the sheet 21, the latter is progressively folded into tubular or bag body form by drawing it along and about the former plate 23 (Figs. 3 and 4). In starting a sheet of paper 21 through the machine, its forward end portion is folded about the former plate 23 and thrust between the draw rolls 37—38 (Fig. 16). These latter rolls register with an aperture 111 in the former plate and grip the sheet at this point. Thereafter, upon starting the machine the draw rolls pull the sheet along and it is progressively folded about the former plate in the usual manner. The former plate 23 (Fig. 4) embodies a long rectangular horizontal body portion and an upwardly inclined portion at its leading end. Former plates of this general character are well known in the art and, accordingly, further description of its operation is believed to be unnecessary. Aside from the special tearing end construction heretofore described the former plate herein shown differs from the usual construction only in that a longitudinal slot 112 (Fig. 4) is fashioned in it. This center slot forms an open way for the lifting strips 11 glued on the sheet 21 so that the former plate does not tend to dislodge them. To further aid in holding the strips 11 in position the belt 59 (Figs. 12 and 14) is arranged to press the strips against the sheet 21 while the sheet is passing along the inclined forward portion of the former plate and any tendency of the strips to slide down this incline is thus checked.

By attaching the lifting strips 11 to the center portion of the sheet 21 any impediment to proper folding of the sheet about the former plate 23 is avoided. In other words, the strips are attached to a part of the sheet, namely, the center portion, which is not longitudinally folded during the formation of the bag, but is, on the other hand, retained substantially flat throughout such forming operation. As a consequence the strips do not interfere with the longitudinal folding of the sheet into tubular form.

The usual draw-in rollers 39 (Figs. 14 and 15) are pivotally mounted above the horizontal portion of the former plate 23. Adjustable weights 113 on arms 114 which carry these rollers are utilized for governing the pressure which they exert. These draw-in rollers tend to pull the side edge portions of the advancing sheet 21 into proper overlapping relation. Also in the usual manner a finger 115 (Fig. 15) is used to push down the side edge portion 15 of the sheet so that it is held out of contact with the other edge portion 14 until the two are pulled into proper overlapping relation for gluing them together. While passing between the draw rolls 37—38 the overlapping portions 14—15 of the sheet are pressed tightly together to complete the longitudinal bag seam.

At station C (Figs. 15 and 16) the tubularly formed sheet 21 is severed into successive sections 10a by the striker bar 40. As previously noted, the end of the former plate 23 is fashioned to constitute a tearing edge or cutter to cooperate with the striker bar for severing the bottom wall of the tube. The upswinging striker bar 40 (Fig. 16) pulls the lower side of the tube up across the end of the former plate 23. Consequently, the sharp teeth 30 (Fig. 4) tear this bottom tube wall along lines merging with the center slit 26, which at this instant registers with the end of the former plate. The projecting strip 11 is pulled up across the rounded center part 29 of the former plate 23, however, so that it is not torn off or damaged.

A suitable alternative former plate end is shown in Fig. 17. The same reference numerals have been used for identical parts. It differs from that of Fig. 4 only in that it is recessed at 29a to protect the projecting strip end rather than having a rounded edge in its center portion.

The striker bar 40 also serves to tear off the top wall of the bag material tube. Cooperating with it for this purpose is a stationary cutter 116 (Figs. 15 and 16) presenting a concave series of cutting teeth 117. This cutting edge or series of teeth is concave so that the top wall will be torn off along a correspondingly curved line to form the flap 19 at the mouth of the completed bag (Fig. 1). Furthermore this concave series of teeth is offset from the end of the strips 11 so that this upper row of teeth has no tendency to tear the projecting strip ends.

After leaving station C the severed bag sections 10a have their lower ends folded and glued at station D (Fig. 6) and are carried away by the conveyor belts 24—25, all in the usual manner. This apparatus following station C may all be of conventional form and, accordingly, further description is believed to be unnecessary.

From the foregoing description of the construction and operation of the machine it will be apparent that great nicety of timing is required between many of the parts. This problem is especially acute in view of the extreme speeds of material feeds encountered in turning out bags at a rate of 350 per minute as the machine above described is capable of doing. With such high speeds, even a small error in timing will be so greatly multiplied in the course of a few minutes of operation as to spoil the product. The positive maintenance of a timing relation once established is insured by actuating all of the parts through positive gear drives from a single or common source of power. To obtain the required precise timing and enable the machine to be adjusted for the making of bags of different lengths and widths, provision is made for:

(*a*) Adjustment of the fold forming mechanism so that the position of the fold in the lifting strip may be varied relative to the advancing end of the strip;

(*b*) Adjustment of the knife 93 and the glue applicator finger 88 with respect to the movement

of the lifting strip so that the folded strips will be applied at the proper points to the advancing paper sheet; and

(c) Adjustment of the slit forming knife in relation to the striker bar 40 for cutting off the successive bags.

Adjustment of the fold forming mechanism is effected by advancing or retarding the gears of the trains which extend from a common point at the bevel gears 67 successively to stations F, E, and A. For this purpose, one of the gears can be advanced one tooth or more with respect to the next meshing gear until the one of the driven rollers selected for adjustment has been turned to the angular position necessary for proper timing of the operation which it performs. Next, the timing of the knife 93 and the applicator 89 is changed by advancing or retarding the gear 77 so that each strip 11 will be delivered at exactly the right instant for location properly with reference to the slit 21 and the glue spot 20. Finally, the angular position of the knife 93 (Fig. 7) can be changed by advancing or retarding the gears 71 and 72 so that each slit 21 will be disposed directly opposite the striker bar at the time the latter acts to cut off a bag. As an incident to adjustment of the gears 71 and 72, it will be noted that the previously adjusted relationship between the knife 93 and the folding mechanism will not be disturbed.

In some instances the advance of a full tooth on one of the gears may be too coarse an adjustment. To take care of such a contingency, various gears in the train are adjustably secured to the shafts which carry them. For example, at station A the gear 77 (Fig. 10 and see also Fig. 7), which is carried on shaft 36ª of the roller 36, is secured to this shaft by a split sleeve clamp 77ª. Upon loosening this clamp the shaft 36ª can be turned relative to the gear 77 so as to adjust its position with precision and through as small an angle as may be desired. Thereafter, the clamp is, of course, retightened. It will be noted that during this adjustment the rollers 35 and 36 remain connected to each other through the gears 35G and 36G (Fig. 9) at the opposite end of the shaft 36ª from the gear 77. Accordingly, an angular adjustment of the roller 36 will effect a corresponding turning of the opposed roller 35 so that the knife 93 always remains in proper angular position for registry with the slot 94 in the roller 35. In the other pairs of rollers carrying cooperating parts the adjustment of these parts may be similarly maintained.

From the foregoing it will be seen that the relative timing of all of the cooperating machine parts can be adjusted with extreme precision. Having once been adjusted, the machine can be set in operation and bags are turned out entirely automatically with the lifting strips attached and accurately located inside them, all at a very high rate of speed.

I claim as my invention:

1. The method of forming a bag with a folded lifting strip therein, which comprises, advancing a continuous sheet of bag material in an endwise direction, attaching one end of a folded strip to the longitudinal center portion of said sheet during the advance of the latter and with the strip extending longitudinally of the sheet, folding the side edge portions of said sheet inwardly into overlapping relation with each other and about said strip to form a bag body enclosing said strip, and cutting off the folded sheet to complete the bag.

2. The method of forming a bag with a folded lifting strip therein, which comprises, advancing a continuous sheet of paper or the like in an endwise direction, attaching one end of a folded strip to said sheet during the advance of the latter, folding said sheet about said strip to form a bag body, and cutting off the folded sheet to complete the bag.

3. The method of forming a bag with a folded lifting strip therein, which comprises, doubling a strip upon itself to form a lifting strip, gluing one end of the strip to a face of a sheet of bag material, and folding the sheet into the form of a bag body with said sheet face constituting an inner wall of the bag.

4. The method of forming bags with a folded lifting strip in each, which comprises, advancing an elongated sheet of paper or the like endwise, attaching folded strips to said sheet at successive points along its longitudinal center portion, then progressievly folding the side edge portions of the sheet inwardly into overlapping relation with each other and overlying said strips to bring the sheet into generally tubular bag body configuration with the strips enclosed in the tube while retaining the central portion of the sheet and to which the strips are attached substantially flat, and severing the tubularized sheet at successive points intermediate the points of strip attachment.

5. The method of forming bags with interiorly located folded lifting strips which includes the steps of advancing a continuous sheet of paper and a narrower ribbon endwise along adjacent paths at continuous rates and severing and folding strips from said ribbon at a rate synchronized with the rate of sheet advance, attaching the folded strips to said sheet at spaced points therealong, and folding said sheet about the successive strips to form bag bodies.

6. The method of forming bags with interiorly located folded lifting strips, which includes the steps of advancing a continuous sheet of paper or the like endwise at a continuous rate, severing and folding strips from a continuously advancing ribbon at a rate synchronized with the rate of sheet advance, attaching successive strips to the advancing sheet at equally spaced points along the sheet, folding the sheet about the strips, and cutting the folded sheet into successive bag lengths at points disposed between the successive strips.

7. The method of forming bags with an interiorly located folded lifting strip in each, which comprises, advancing endwise a continuous sheet of paper or the like, slitting the sheet transversely at spaced points along its center line and intermediate its side edges, attaching folded strips to the center portion of the sheet at spaced points with a free end of each strip overlying a corresponding slit, progressively folding the sheet about the strips in a bag body form, and cutting off successive portions of the sheet along transverse lines merging with the ends of the slits.

8. The method of forming a bag with an interiorly located folded lifting strip having one end protruding from the bag mouth, which comprises, advancing endwise a continuous sheet of bag material, partially severing the sheet in a transverse direction at successive points during its advance, then attaching folded lifting strips to the sheet at spaced points with a portion of each strip overlying a corresponding slit in the sheet, folding the sheet about the strips in bag

body form, and completing the transverse severance of the sheet at the point where it was previously partially severed.

9. The method of forming bags each having long and short walls and an interiorly disposed folded lifting strip with long and short legs respectively disposed adjacent said long and short walls, said method comprising advancing a sheet of bag material endwise at a uniform speed, advancing a narrower ribbon endwise and alongside said sheet at a substantially greater speed, cutting successive lengths from said ribbon, folding each length to form a folded strip with said short leg facing said sheet, decreasing the speed of advance of the folded strip to bring the same into synchronism with said sheet, attaching the short leg of the strip to said sheet, folding the sheet longitudinally about the strip to form a seamed bag body, and severing said folded body along transverse lines respectively extending across opposite sides of the body and longitudinally spaced on opposite sides of the end of the long leg of said strip.

10. The method of forming bags having interiorly disposed folded lifting strips comprising advancing a paper sheet endwise, advancing a narrower ribbon endwise at a substantially greater speed than said sheet, cutting successive lengths from said ribbon, folding each length to form a folded strip, decreasing the speed of advance of the folded strip to bring the same into synchronism with said sheet, attaching the adjacent leg of the strip to said sheet, folding the sheet longitudinally about the strip to form a bag body, and cutting the folded body into bag lengths each having a folded strip disposed therein.

11. The method of forming bags having interiorly disposed folded lifting strips which includes the steps of advancing a sheet of bag material endwise, advancing a narrower ribbon endwise at a substantially greater speed along a path substantially merging with the path of said sheet, cutting successive lengths from said ribbon, folding each length to form a folded strip, and decreasing the speed of advance of the folded strip to bring the same into substantial synchronism adjacent the points of mergence of said paths.

12. A bag forming machine comprising, in combination, means for advancing in an endwise direction a continuous sheet of paper or the like, means for advancing a strip of material alongside said sheet and forming the same into separated folded strips, means for attaching one end of each folded strip to the sheet during its advance by said first named means, means for folding the sheet about the strip in the form of a bag body, and means for cutting off the folded portion of the sheet to complete the bag.

13. A bag forming machine comprising, in combination, means for advancing in an endwise direction a continuous sheet of bag material, means for advancing a strip of material alongside said sheet and forming the same into separated folded strips, means for attaching one end of each folded strip to the longitudinal center portion of the sheet while the latter is being advanced by said first named means and with the strip extending longitudinally of the sheet, means for folding the side edge portions of the sheet inwardly into overlapping relation with each other and about the strip to form a bag body enclosing the strip, and means for cutting off the folded sheet to complete the bag with the strip disposed therein.

14. A bag forming machine comprising, in combination, means for advancing in an endwise direction a continuous sheet of bag material, means for advancing a strip of material alongside said sheet and forming the same into separated folded strips, means for attaching one end of each folded strip to the longitudinal center portion of the sheet while the latter is being advanced by said first named means and with the strip extending longitudinally of the sheet, a former plate embodying an elongated flat body portion and an upwardly inclined leading end portion, means for drawing the sheet with the strip attached along the bottom of said former plate and for folding the side edge portions of the sheet progressively inward about said former plate into overlapping relation while retaining the center portion of the sheet flat against the bottom of said former plate, and means for cutting off the folded sheet as it leaves said former plate to complete the bag.

15. In a machine of the type described, the combination of means for advancing in an endwise direction an elongated sheet of paper or the like, means for advancing a strip of material alongside said sheet and forming the same into separated folded strips, means for attaching the folded strips to said sheet at successive points along its longitudinal center portion, means for progressively folding the side edge portions of the sheet inwardly into overlapping relation with each other and overlying the strips to bring the sheet into generally tubular bag body configuration with the strips enclosed in the tube, said last named means being operative to retain the central portion of the sheet substantially flat during said folding operation, and means for severing the tubular sheet at successive points intermediate the points of strip attachment.

16. In a machine of the type described, the combination of means for advancing in an endwise direction a continuous sheet of paper or the like, means for slitting the sheet transversely at spaced points along its center line and intermediate its side edges during the advancing movement thereof, means for advancing a strip of material alongside said sheet and forming the same into separated folded strips, means for attaching the folded strips to the center portion of the sheet at spaced points with a free end of each strip overlying a corresponding slit, means for progressively folding the sheet about the strips in a bag body form, and means for cutting off successive portions of the sheet along transverse lines merging with the ends of the slits.

17. In a machine of the type described, the combination of means for advancing in an endwise direction a continuous sheet of bag material, means for partially severing the sheet in a transverse direction at successive points during its advance, means for attaching folded lifting strips to the sheet at spaced points with a portion of each strip overlying a corresponding slit in the sheet, means for progressively folding the sheet about the strips in bag body form, and means operable in timed relation with said first named severing means for completing the transverse severance of the sheet at the points where it was previously partially severed.

18. In a machine of the type described, the combination of means for feeding a continuous sheet of paper or the like in an endwise direction and at a substantially continuous rate, means

for severing and folding successive strips from a continuous ribbon of material, means for attaching the successive folded strips to the advancing sheet, and means for correlating the rates of operation of said first and second named means.

19. In a machine of the type described, the combination of means for directing a continuous sheet of paper or the like and a continuous ribbon along respective individual paths merging at a point in which the two materials are moving in the same direction, means for severing and doubling upon itself the advancing ribbon to form it into successive folded strips prior to its arrival at said point, power actuated means for feeding the ribbon in the initial portion of its path at a rate substantially greater than that of the sheet advance so as to compensate for the greater length of ribbon required to match the length of sheeting in view of the doubling of the ribbon, said power actuated means also being effective to feed the severed and folded portions of the ribbon at a slower rate matching that of the sheet substantially at said point of path merger, and means for attaching successive folded strips to the advancing sheet while the sheet and strips are advancing at matched rates.

20. In a machine of the type described, the combination of means for feeding in an endwise direction a sheet of bag material, means for severing successive sections from a continuous ribbon and doubling each of them upon itself to form a folded lifting strip, means for feeding the strips from said folding means onto the sheet, said last named means including a plurality of serially arranged feed rollers through which the strips are directed, and means for operating said pairs of rollers in timed relation and at successively slow speeds along the path of strip advance.

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