April 12, 1949. G. W. POPPE 2,466,823

PAPER BAG TUBE SEVERING MACHINE

Filed Oct. 11, 1946 4 Sheets-Sheet 1

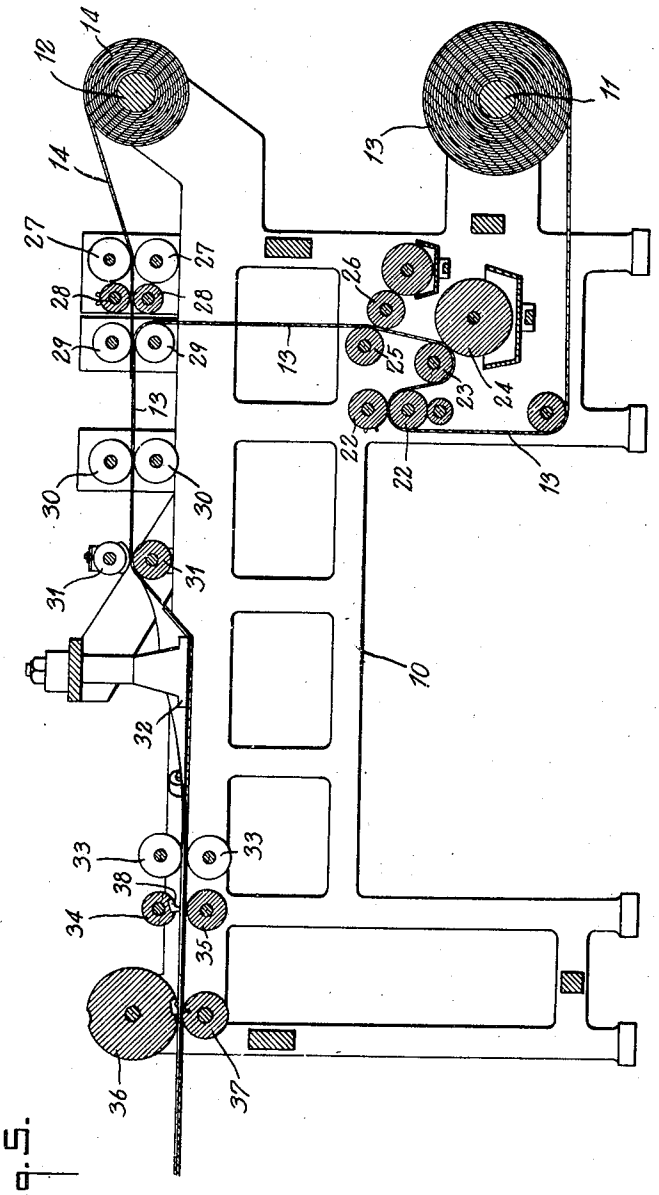


Fig. 1.

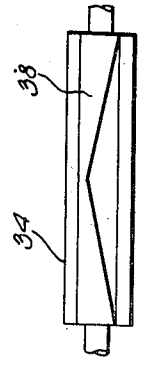


Fig. 5.

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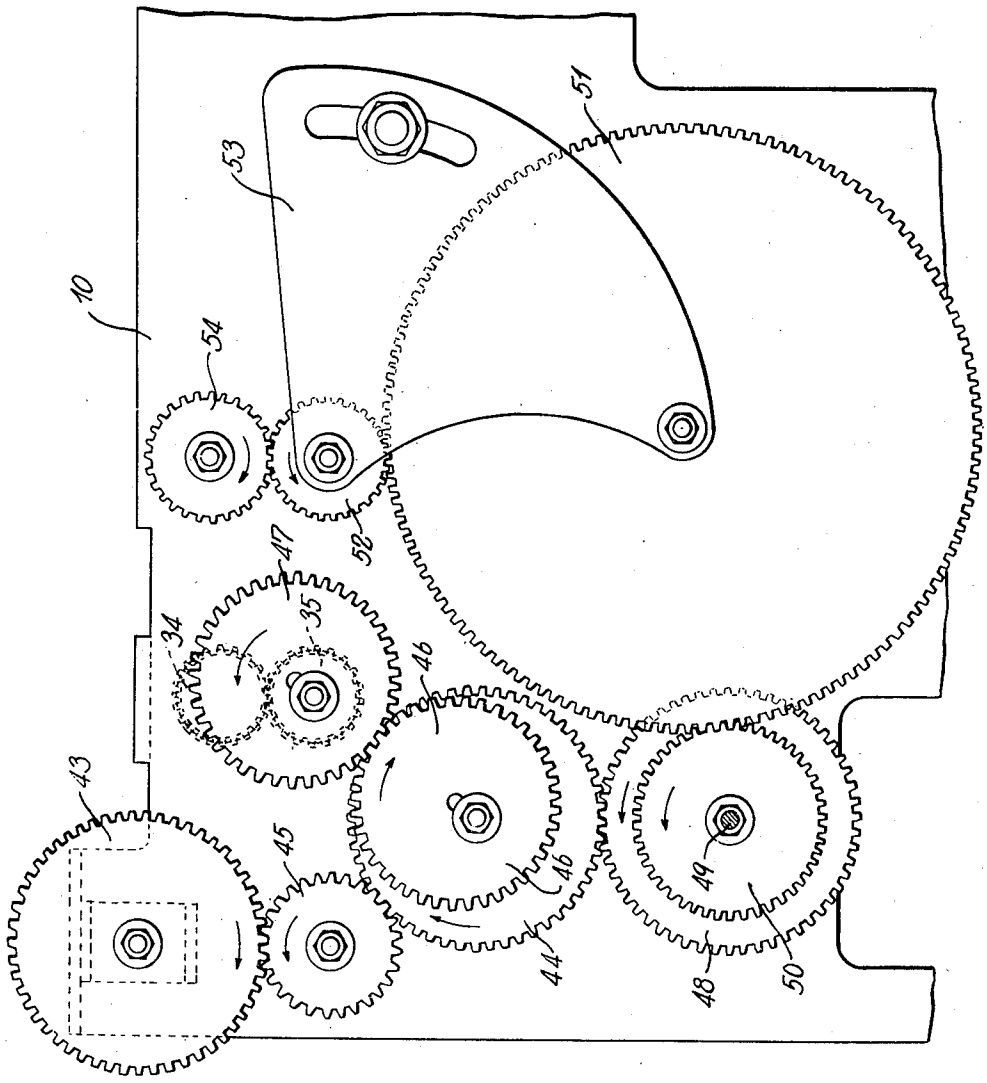


Fig. 2

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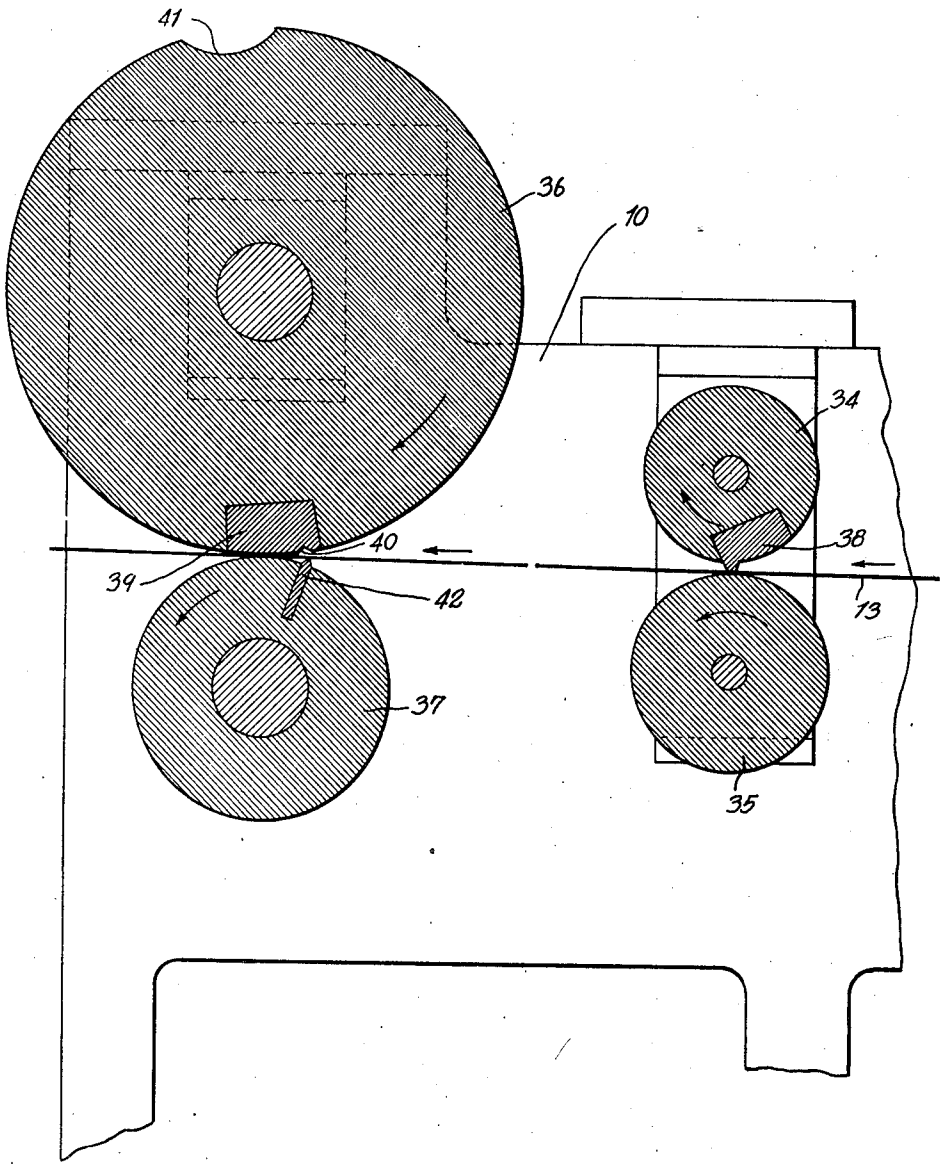


Fig. 3.

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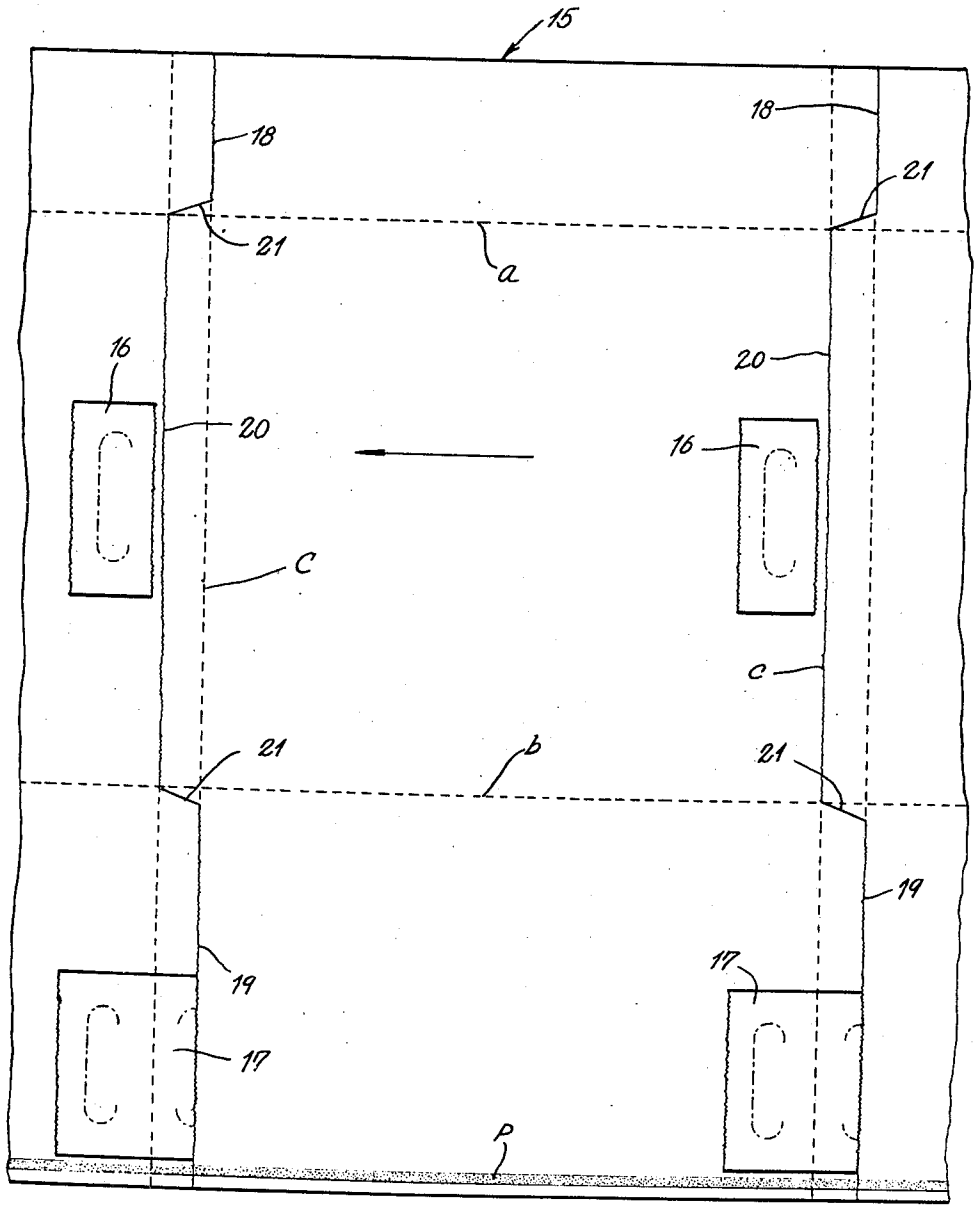


Fig. 4.

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UNITED STATES PATENT OFFICE

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PAPER BAG TUBE SEVERING MACHINE

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7 Claims. (Cl. 164—84.5)

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This invention relates to paper bag tube severing machine.

In one method of making paper bags, a paper web while being advanced lengthwise of the web is transversely weakened at predetermined longitudinal intervals, after which it is folded into tube form and separated along the weakened portions to form tubular bag blanks. Much difficulty has been encountered in satisfactorily separating the tube bag blanks from the remainder of the web in the high speed production of large size bags.

An object of this invention is an improvement in the tube blank separating mechanism of bag making machines by the use of which large, as well as small bags, may be produced at high speed.

According to this invention, the weakened tubulated web is simultaneously gripped between two sets of rollers with the weakened portion of the web interposed between the two sets. The timing of the rollers is such that the main body of the tubulated web is temporarily slowed down slightly while the bag blank to be separated is temporarily advanced at high speed. The pull thus produced effects separation of the bag blank from the remainder of the web which is immediately released and allowed to proceed at its normal speed. Means are provided to adjust the length of time that the tubulated web is slowed down to adapt the mechanism for the different production speeds incident to the formation of different length bags.

Other objects, novel features and advantages of this invention will become apparent from the following specification and accompanying drawings, wherein:

Fig. 1 is a vertical section through a machine embodying the invention;

Fig. 2 is a side elevation of a portion of the machine;

Fig. 3 is an enlarged fragmentary view similar to Fig. 1;

Fig. 4 is a plan view of the web at an intermediate stage in the production of the bags, and

Fig. 5 is a detail view.

A frame 10 supports a pair of bars 11 and 12, of which the bar 11 supports a roll of paper or other suitable web 13 while the bar 12 supports a pair of rolls of paper or other suitable web 14. By means subsequently to be described, the web 13 is transversely perforated and obliquely slit to outline the blank 15 shown in Fig. 4 and the two webs 14 are converted into patches 16 and 17 pasted to the blank 15. In preparing the web 13 for the production of bags, the web is transversely

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perforated inwardly from each edge along lines 18 and 19 and is also perforated transversely along the line 20, the latter line being spaced forwardly of the other two lines and being of slightly less extent than the distance between the inner ends of the other two lines. The web is subsequently slit along lines 21 extending between the inner ends of the lines 18 and 19 and the outer ends of the line 20. The perforations and the slits together outline the blank 15 which eventually is formed into a bag.

After the web has been perforated, as above described, the patches 16 and 17 are fixed thereto and later each patch, as well as that portion of the web 13 underlying the patch is die cut along the dot-dash lines of Fig. 4 to form finger holes and locking tabs. After the application of the patches, the slits 21 are formed and the web is folded into tube form in the usual manner and later the blank 15 in tube form is broken away from the remainder of the tubulated web by means subsequently to be described.

From its supply roll, the web 13 is led around a guide roller and between a pair of perforating cylinders 22 which perforate the web along the lines 18, 19 and 20. From the perforating cylinders 22, the web passes around a backing roller 23 suitably arranged with respect to a paste-delivering roller 24 to supply a line of paste P along that edge of the web 13 at which the perforation 19 begins. After the application of the paste line P, the web 13 passes between a backing roller 25 and a paste-delivering roller 26, by which paste is applied to the web over the areas to which the patches 16 and 17 are to be affixed.

The webs 14 lead from their supply rolls to a pair of feed rollers 27 which advance the webs 14 to die rollers 28 which sever the web into the patches 16 and 17. These patches, together with the web 13, are passed between a pair of feed and pressure rolls 29 with the patches in register with the paste areas on the web so that the patches are affixed to the web. Next, the web 13, with the applied patches 16 and 17 passes between another pair of feed rollers 30 from which the web passes between a pair of slitting cylinders 31 which slit the web along the lines 21. The web is now in condition for formation into a tube and for separation of the tube into bag sections.

From the rollers 31, the web 13 with the applied patches 16 and 17, passes around a former plate 32 by means of which the edges of the web are folded inwardly into overlapping relation along the dotted lines *a* and *b* with the paste line P of the one folded-in portion engaging the outer

surface of the other folded-in portion. After the web has been thus folded, the tubulated web passes between identical feed rollers 33 driven in unison by means hereinafter described and the feed rollers 29 and 30 as well as the upper slitting cylinder 31, are driven from the feed rollers 33 by means (not shown) at the same surface speed as the rollers 33, while the feed rollers 27 and the patch-cutting rollers 28 are rotated by means (not shown) at the proper rate to supply patches to the web at bag length intervals. The rate of feed of the web 13 through the machine is determined by the surface speed of the feed rollers 33. The feed rollers are of such design that they contact the tubulated web 13 only along the edges thereof.

After leaving the feed rollers 33, the tubulated web passes through mechanism by means of which it is separated into bag sections. This mechanism comprises a first pair of rollers 34 and 35 and a second pair of rollers 36 and 37 between which the tubulated web passes successively. The roller 34 is of slightly less diameter than the roller 35 and is provided with a pinch bar 38 projecting from its surface and extending from end to end of the roller. The pinch bar 38 may have its leading edge parallel to the roller axis or may be of the shape shown in Fig. 5 in which its leading edge is in the shape of a flattened V with the apex thereof to the rear of the remainder. The bar 38 has a curved outer surface coaxial with the roller 34 and of the same radius as the roller 35. The arrangement is such that as the tubulated web 13 passes between the rollers 34 and 35, it is periodically gripped between the pinch bar 38 and the roller 35, but otherwise advances independently of the rollers at a rate depending upon the surface speed of the feed rollers 33.

The diameter of the roller 36 is twice that of the roller 37 which rotates twice for each rotation of the roller 36. The roller 36 is provided with an inset 39 projecting slightly beyond the roller surface and having a groove 40 extending parallel to the roller axis. Diametrically opposite the groove 40, the roller 36 is provided with an arcuate recess 41 extending parallel to the roller axis. The roller 37 is provided with a scoring bar 42 extending parallel to its axis and projecting slightly beyond the roller surface. The arrangement is such that the scoring bar 42 registers alternately with the groove 40 and the recess 41 for each complete rotation of the roller 36 so that the web 13 is gripped between the inset 39 surface and the roller 37 once for each rotation of the roller 36 but otherwise advances independently of these rollers. The rollers 36 and 37 are provided with suitable means (not shown) for die cutting the web and patches along the dot-dash lines of Fig. 4.

A gear 43 is fixed to the roller 36 and an identical gear 44 is rotatably supported by the frame 10. Both gears 43 and 44 mesh with a gear 45 fixed to the roller 37. A gear 46 is fixed to the gear 44 and an identical gear 47 is fixed to the roller 35 in mesh with the gear 46. Each gear 46 and 47 is so mounted as to be adjustable from concentricity to different positions of eccentricity with respect to the axes of rotation of the gear 44 and the roller 35 respectively. The rollers 34 and 35 are interconnected by suitable gearing for rotation in unison. A gear 48 identical with the gear 44 and in mesh therewith is mounted on a shaft 49 driven at constant rotational speed by any suitable means (not shown). A gear 50 mounted on the shaft 49 meshes with a gear 51 which also meshes with a gear 52 rotatable with the bottom feed roller 33. The gear 51 is journalled on a bracket 53 pivotally supported coaxial with the gear 52 and a gear 54 rotatable with the upper feed roller 33 is in mesh with the gear 52.

The roller 37 makes two complete revolutions for each complete revolution of each of the rollers 34, 35 and 36. The arrangement is such that with the tubulated web 13 gripped between the inset 39 of the roller 36 and the roller 37, the web is also gripped between the pinch bar 38 of the roller 34 and the roller 35 with one set of perforations 18, 19 and 20 and slit portions 21 of the web intermediate the two sets of rollers. The radius of the pinch bar 38 surface and of the roller 35 is such that the surface speed thereof is substantially less than the surface speed of the roller 37 so that when the web is gripped by both sets of rollers that part of the tubulated web ahead of the perforations and slits is caused to move faster than the web is delivered by the feed rollers 33 and that part of the tubulated web following the perforations and slits is caused to move at a slower rate than the web is delivered by the feed rollers 33. As a result, tubulated blanks are successively pulled away from the tubulated web and there is a slight temporary back-up of the web between the feed rollers 33 and the pinch bar rollers. The severance of the tubulated blank from the tubulated web occurs immediately after the gripping of the tubulated blank by the rollers 36 and 37 and the gripping of the tubulated web by the rollers 34 and 35 and practically simultaneously with the severance operation the tubulated blank is scored and the patches as well as the underlying web are cut along the dot-dash lines of Fig. 4, after which the rollers 36 and 37 release the tubulated blank which is gripped by take-off rollers (not shown) while the pinch bar rollers 34 and 35 release the tubulated web for advancement by the feed rollers 33 at the surface speed thereof. Upon the next full revolution of the roller 37, the scoring bar 42 registers with the recess 41 of the roller 36 so that the tubulated web is not gripped between the rollers 36 and 37 until the roller 36 completes a full revolution.

As previously set forth, the shaft 49, together with the gear 48 are driven at constant rotational speed and the machine is conditioned for the production of different length bags within a given range by varying the rate of feed of the web. The change of the rate of feed of the web is effected by changing the gearing between the shaft 49 and the bottom feed roller 33. To do this, either a larger of smaller diameter gear 50 is substituted for the gear 50 shown in Fig. 2 and the bracket 53 is correspondingly adjusted to arrange the gear 51 in mesh with the substituted gear 50, the gear 51 always remaining in mesh with the gear 52. A large gear 50 causes faster rotation of the feed rollers 33 than a small diameter gear 50 and the desired rate of feed is obtained by making use of the proper size gear 50. In the production of the maximum length bag, the web 13 is advanced at higher speed than in the production of the minimum length bag. For any given web feed speed (dependent upon the length of the bag being produced), there is a surface speed of the pinch bar 38 and roller 35 which will delay the travel of the tubulated web sufficiently to effect severance of the tube blank 15 from the tubulated web 13 without delaying the web feed unduly to cause an excess of web to be delivered into the

space between the feed rollers 33 and the pinch bar rollers of such magnitude as to result in sufficient distortion of the web to prevent proper operation of the machine. A longer web delay is needed for low web speeds to effect sufficient relative movement of the tube blank and the tubulated web to effect severance of the tube blank from the tubulated web. A shorter web delay is needed for high web speeds to prevent undue back-up of web between the pinch bar rollers 34 and 35 and the feed rollers 33. Variation in the surface speed of the pinch bar 38 and roller 35 at the time of clamping the tubulated web is effected by adjustment of the gears 46 and 47.

With the gears 46 and 47 in the position shown in Fig. 2, the surface speed of the pinch bar 38 and the roller 35 at the time of clamping the web is maximum and with the gears in the opposite position of eccentricity, the surface speed of the pinch bar 38 and the roller 35 at the time of gripping the web 13 is minimum. For operation of the machine to produce maximum length bags, the arrangement of the gears 46 and 47 is as shown in Fig. 2 while, for the production of minimum length bags, the eccentricity of the gears 46 and 47 is just opposite from that shown in Fig. 2. Thus, the hold-back time is made minimum for high web feed speeds and maximum for low web speeds.

In the operation of the above-described separating mechanism, the pinch bar rollers 34 and 35 firmly grip the tubulated web across its entire width and create a slight slack between the pinch bar rollers and the feed rollers 33 thereby effectively preventing the transmission of any pull or jerk resulting from the separating operation to that section of the web contacting the heel of the former plate 32 where breakage frequently occurs along the weakened or perforated transverse sections of the web. The possibility of distortion of the web to an extent to cause interruption of the machine operation is thus avoided. With this type of machine, it is possible to run a much heavier base weight paper than previously has been the case. Also, by reason of the positive gripping of the web by the pinch bar rollers and the temporary slowing down of the web, it is possible to produce bags nearly equal in length to the circumference of the rollers 36 as the slowing down of the web and the positive gripping of it throughout its entire width by the pinch bar rollers 34 and 35 effects separation of the tubulated blank from the tubulated web with the surface speed of the roller 36 exceeding the surface speed of the feed rollers 33 by only five per cent. Furthermore, by reason of the positive gripping of the web by the pinch bar rollers, the weakened lines 18 and 19 may be rows of very fine perforations since there is a positive pull over the full extent of the lines and a clean break results. In addition, there is no agitation of the web of a nature which might tend to displace the patches, the paste for which has not had time to set during the period between its application and the blank severing operation. With the pinch bar of Fig. 5, the added advantage is obtained of having the severing pull applied first to the edges of the web so as to start severance easily by a shearing action, at the outer ends of the weakened lines and progress inwardly toward the middle. This action is the result of having the leading edge of the pinch bar converge rearwardly from both ends toward the middle.

I claim:

1. A machine including the combination of a feeder for continuously pushing a traveling web of flexible material from it, a speed-up device spaced from said feeder for gripping said material fed therefrom and intermittently forcing the gripped portion thereof to a higher traveling speed than is imparted by said feeder, a slow-down device between said feeder and said speed-up device for gripping said material and intermittently forcing the gripped portion thereof to a slower traveling speed than is imparted by said feeder, whereby said material is intermittently tensioned to sever a length of said material from the remainder and whereby an excess of said material intermittently collects between said feeder and said slow-down device in synchronism with the latter's operation and said tension is isolated from said feeder by said excess of said material, and including a system for variably fixing the material feeding speed of said feeder independently of the frequency of the described intermittent operations of said devices whereby to vary the length of the severed material.

2. The machine defined by claim 1 with said machine further including a system for adjustably fixing the amount of slow-down action of said slow-down device relative the material feeding speed of said feeder, whereby to adjustably fix the amount of said excess of said material which intermittently collects between said feeder and said slow-down device.

3. The machine defined by claim 1 with said combination further including a system for variably fixing the material feeding speed of said feeder independently of the frequency of the described intermittent operations of said devices whereby to vary the length of the severed material, and a system for adjustably fixing the amount of slow-down action of said slow-down device relative the material feeding speed of said feeder, whereby to adjustably fix the amount of said excess of said product which intermittently collects between said feeder and said slow-down device.

4. A machine including the combination of a rotary feeder for continuously feeding a flexible web by pushing it therefrom, a speed-up rotary gripper device spaced from said feeder for periodically gripping said web and controlling the speed of the gripped portion of said web, a slow-down rotary gripper device positioned between said speed-up device and said feeder for periodically gripping said web and controlling the speed of the thereby gripped portion of said web, and rotary gearing intergearing said devices for synchronous gripping operation with a gear ratio causing said speed-up device to have a faster web-controlling speed than said slow-down device and for intergearing said feeder with said devices with a gear ratio causing it to have a feeding speed faster than the web-controlling speed of said slow-down device and slower than the web-controlling speed of said speed-up device, said gearing having a gear train for said feeder which includes two intermeshed gears with one thereof mounted on a bracket pivoted at the axis of the other so it may swing while continuously meshing with said other gear and a shaft positioned for mounting a third gear intermeshing with said swinging gear and having releasable gear mounting means permitting releasable application of gears having a range of diameters.

5. The machine defined by claim 4 with said gearing having a gear train for said slow-down gripper including intermeshing gears of equal pitch diameters and which are radially shiftable

from their rotating axes in similar directions angularly correlated with the active part of said rotary slow-down gripper to cause speed changing thereof during its material gripping phase.

6. The machine defined by claim 4 with said gearing having a gear train for said feeder which includes two intermeshed gears with one thereof mounted on a bracket pivoted at the axis of the other so it may swing while continuously meshing with said other gear and a shaft positioned for mounting a third gear intermeshing with said swinging gear and having releasable gear mounting means permitting releasable application of gears having a range of pitch diameters, and with said gearing further having a gear train for said slow-down gripper including intermeshing gears of equal pitch diameters and which are radially shiftable from their rotating axes in similar directions angularly correlated with the active part of said rotary slow-down gripper to cause speed changing thereof during its material gripping phase.

7. A machine including the combination of mutually spaced rotary grippers for periodically gripping a product traveling therebetween and controlling the traveling speed of its portions

gripped thereby, and gearing between said grippers for synchronous operation and including two gear elements of equal pitch diameters which intergear and are radially shiftable from their rotating axes in similar directions, angularly correlated with the active part of said gripper to cause speed changing thereof, whereby the web-controlling speed ratio between said devices may be controlled without loss of synchronization of said devices' cooperative gripping action.

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