Jan. 26, 1932. A. WINKLER ET AL 1,842,926

MACHINE FOR THE MANUFACTURE OF LOOSELY FOLDED ENVELOPES

Filed July 7, 1930 2 Sheets-Sheet 1

Fig. 1

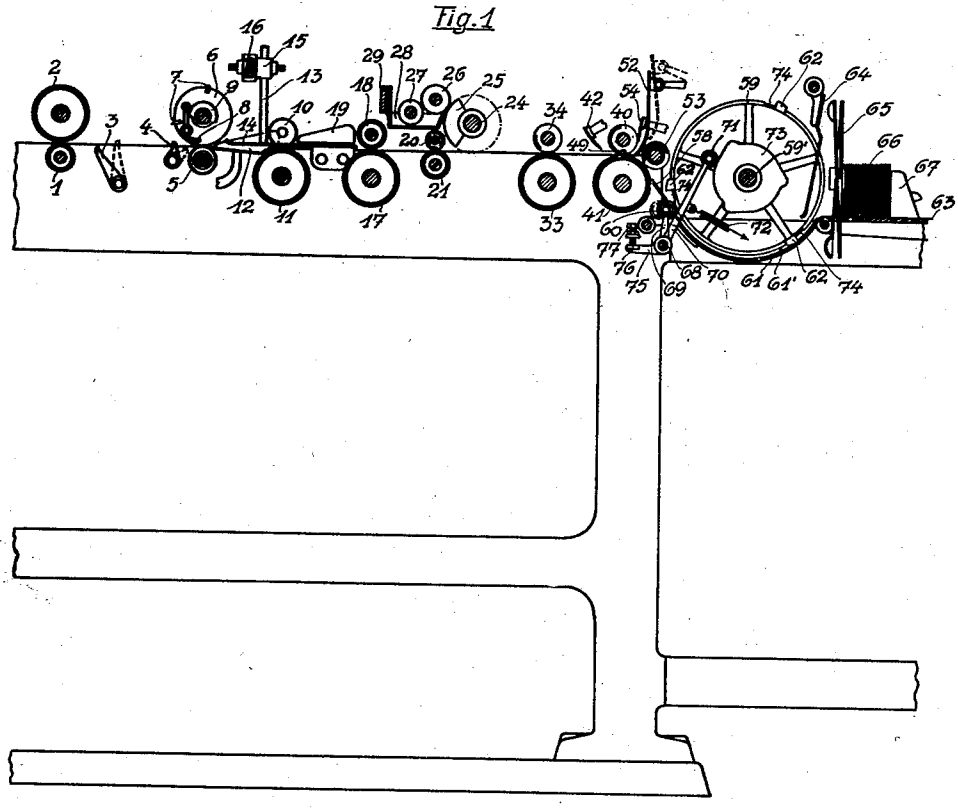


Fig. 2



Fig. 3

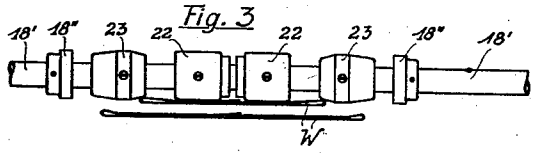
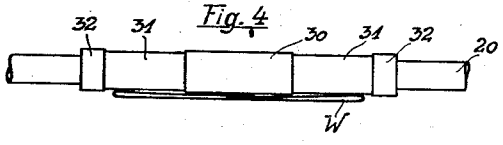


Fig. 4



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MACHINE FOR THE MANUFACTURE OF LOOSELY FOLDED ENVELOPES

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Fig. 5

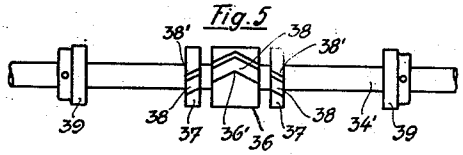


Fig. 6

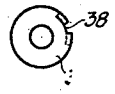


Fig. 7

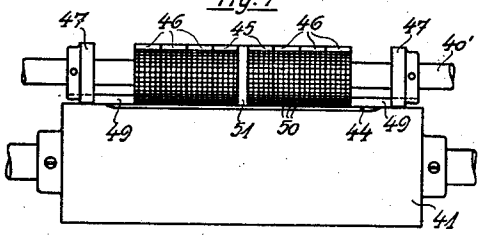


Fig. 8

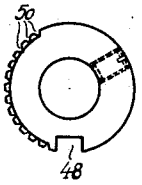


Fig. 11

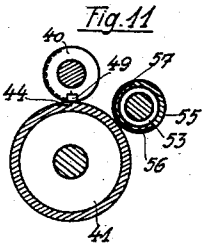


Fig. 9

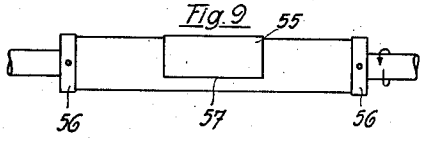


Fig. 10



Fig. 12

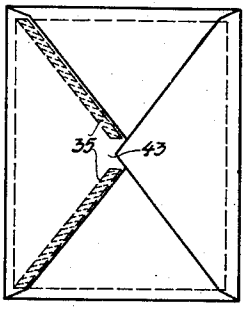
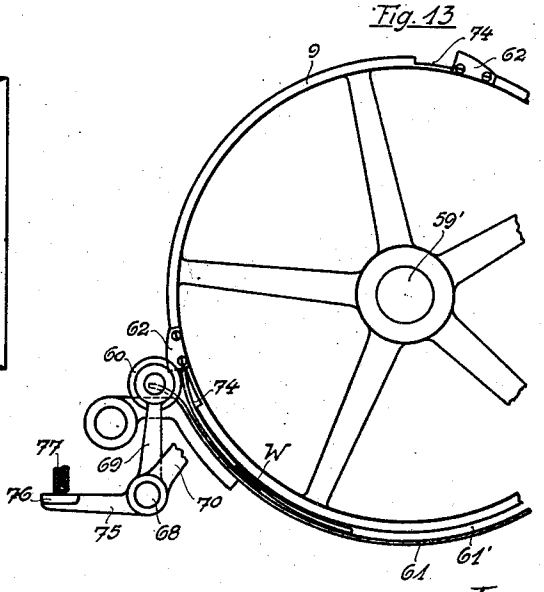


Fig. 13



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Patented Jan. 26, 1932 1,842,926

UNITED STATES PATENT OFFICE

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MACHINE FOR THE MANUFACTURE OF LOOSELY FOLDED ENVELOPES

Application filed July 7, 1930, Serial No. 465,854, and in Germany July, 1929.

This invention relates to a machine for the manufacture of loosely folded envelopes.

In the manufacture of envelopes having side, bottom and closing flaps that do not possess a sharp, but a loose or round fold, only plunger machines with reciprocating flaps have heretofore been employed. The production of such loosely folded goods by means of rotary or roller folding machines presented difficulties in the past, for the reason that the work must be guided during the entire manufacturing process between rollers and their counter rollers and is consequently subjected to considerable pressure if a positive conveyance or feed is to be obtained, and moreover the adjustability of these machines for different sizes and shapes made it impossible to provide special arrangements adapted to a definite shape, as is the case with plunger machines where, in altering the machine from sharply folded to loosely folded goods of one and the same size and shape practically all that is necessary is to change the lower stamp.

One object of the present invention is to provide a roller folding machine of the well known type for making envelopes, in which the rollers and other means that effect the scoring or creasing and the folding and feeding of the work are so constructed and arranged that it is possible to produce not only sharply folded but also loosely folded or bulged goods on the machine without the high capacity of the machine being in the least impaired as compared with flap machines; and without lessening the easy adjustability of the machine to the most varied shapes and sizes of goods.

In accordance with the present invention the scoring or creasing knives are not made sharp but are provided with a blunt round edge. and the rollers, discs, etc., which serve for feeding, folding and pasting are partly recessed or conically shaped, and are partly built-up of sections longitudinally displaceable on their shafts, and partly capable of being lifted and lowered, in such manner that a sharp pressing down of the folds is avoided and the degree of looseness in the folds can be regulated.

With the above and other objects in view, the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings and particularly pointed out in the appended claims, it being understood that various changes in the construction and arrangement and in minor details may be made without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings, Fig. 1 is a vertical longitudinal section through a part of a roller folding machine for the manufacture of envelopes, and Figs. 2 to 13 are detail views; Fig. 2 being a cross section of one of the scoring or creasing knives; Fig. 3 being a view of a special roller for feeding the blanks after the folding of the side flaps; Fig. 4 being a view of a special roller for feeding the blanks to the gumming device; Fig. 5 being a view of a special roller, for receiving the blanks from the gumming device; Fig. 6 being an end view of the same; Fig. 7 being a view of the cooperating rollers for folding over the bottom flap; Fig. 8 being an end view of the upper roller; Fig. 9 being a view of a roller cooperating with the lower roller of Fig. 7; Fig. 10 being a cross section of the roller shown at Fig. 9; Fig. 11 being a cross section of the rollers shown at Figs. 7 and 9; Fig. 12 being a view of the completed envelope and Fig. 13 being an enlarged view of part of the mechanism for conveying the finished envelopes.

The envelope blanks are fed in any suitable manner to the roller pair 1, 2 in stepped formation or overlapping relation and are individually pulled out by this roller pair and are conducted to the two pairs of straightening fingers 3, 4 which operate in the well known manner. The straightened blanks are then seized between the rollers 5, 6 and receive here the preliminary scoring or creasing for the bottom and the closing flap folds. For this purpose the lower roller 5, is provided with a rubber cover in the known manner while the upper roller 6 consists of two segments which can be rotated on their shaft against each other and carries

on each segment one of the scoring or creasing knives 7, so that the distance between the knives can be regulated according to the blank to be handled at any time.

For the manufacture of sharply folded goods the knives 7 have a fairly sharp edge, but according to the present invention, for the production of loosely folded goods they have a blunt, slightly rounded edge (Fig. 2). The equipment of the roller 6 with the flap 8 which is so operated by the stationary cam 9 that it projects at exactly the right moment beyond the roller surface and thereby seizes the work between itself and the lower roller 5 so that the preliminary scoring or creasing of the bottom and closing flap fold are made in the right place, is already well known per se.

As the blanks pass from the rollers 5, 6 to the next roller pair 10, 11, vertically swinging levers 12 engage the two side flaps which up to that time lie perfectly flat and these flaps are thus bent vertically upwards in the well-known manner. This bending takes place over the outer edges of the folding rails 14 attached to the members 13 which can be adjusted by displacing the cross-pieces 15 (carrying the said members 13) on rails 16 to suit the width of the blank. Between the said roller pair 10, 11 and the next pair of rollers 17, 18 the side flaps are folded completely over the said folding rails 14 by means of the slides 19 which reciprocate crosswise of the path of the envelopes. In this manner the side flaps, being folded over the folding rails 14, are loosely folded, and by the use of rails 14 of suitable cross-section folds of any desired looseness may be obtained.

When manufacturing sharply or closely folded goods, the rollers 17, 18 exert pressure upon the folds of the flaps and for this purpose are made cylindrical and smooth. For producing loosely folded envelopes, the roller 18, according to the invention is of special form. This roller 18 must ensure continuous feed and delivery of the blanks to the next roller pair 20, 21, but without exerting pressure upon the folds of the side flaps. The roller 18 therefore is made according to Fig. 3. Its shaft 18′ carries in the center two cylindrical roller parts 22 and to each side thereof another roller part 23, comprising one cylindrical and two conical sections. All the roller parts 22 and 23 can be displaced on their shaft 18′ and their adjustment or regulation is effected in such manner that, with all sizes or shapes of blanks, the roller parts 22 which perform the task of conveying the blanks in all cases, are located at the center of the blank at a sufficient distance from the side folds to avoid a compressing of the same; the roller parts 23, on the other hand, are each adjusted in such a manner that one or other of its conical parts is in line with the said folds. With smaller blanks W, such as that shown in the drawing closely adjacent to the roller, the folds are engaged by the inner conical sections, and on the other hand with larger blanks W, as shown removed from the roller, but otherwise in proper position, the outer conical sections engage the said folds while the intervening cylindrical section is also used for conveying the blank. By suitable adjustment of the roller parts 23 the degree of pressure received by the side folds can be regulated and thus also the looseness of the folds. The parts 18″ serve only as guides or supports to assist in the uniform support of the roller 18 on its counter-roller 17.

After the completion of the turning over and folding of the side flaps, the paste or adhesive is applied thereto as required for the securing of the bottom flap. This paste application corresponds to the strips shown in hatched lines in Fig. 12, and is effected by interchangeable gumming members 25 which are secured on the shaft 24, and receive the paste on their narrow outer surface in the well known manner through the medium of a distributing roller 26 and of the dipping or lifting roller 27 from the receptacle 28 which latter is carried by a cross rail 29.

On account of the space required by this gumming device 24—28, a special conveying roller pair 20, 21 is required so as to ensure that, even with the smallest size of blank, a positive conveyance of the blanks from the roller pair 17, 18 to the gumming members 25 is always obtained. Between this roller pair 20, 21 which merely serves for conveying or feeding the blanks, a sharp or tight pressing of the side flaps folds must be avoided, and the upper roller 20 is therefore made (see Fig. 4) with a center part 30 for feeding the blanks, which part 30 is kept so narrow that the folds of the smallest blank handled by the machine still slightly project beyond the ends of such part. On both sides of this central part 30 recesses 31 are provided which are wide enough to accommodate the folds, from the smallest to the largest size of blank. At the ends of the recesses 31 there are provided guiding or supporting parts 32 of the same diameter as the central part 30, so that the roller 20 bears with its parts 30 and 32 on the lower roller 21 when there is no blank between such rollers.

After the application of adhesive as above described, the blanks are received by the conveying roller pair 33, 34. In this connection, both with sharply folded and with loosely folded blanks, provision must be made to avoid smearing of the gum by the upper roller 34 which makes two revolutions for each passage of a blank. The roller 34 is therefore made with surface gaps in the well known manner, which gaps run spirally on the circumference to correspond to the obliqueness of the said bottom flap pasting strips 35. It

must be taken into consideration, however, that the blanks pass through the machine from left to right (Fig. 1) with the bottom flap leading while in Fig. 12 the bottom flap is drawn to the left. Whereas in the manufacture of sharply folded blanks the upper roller 34 may consist of one piece of the approximate width of the largest size to be handled, this is not feasible for the manufacture of loosely folded blanks for the reason that, even with the smallest size the folds must not be pressed tightly. The roller 34 therefore comprises a central part 36 (Fig. 5) and two spaced parts 37 located at the sides thereof and displaceable in the longitudinal direction of the shaft 34'. The width of the parts 36 and 37 is such that when moved towards one another to their minimum distance their total axial length is less than the distance between the side flap folds of the smallest size of blank, so that the smallest blank can be guided between the rollers 33, 34 without the side folds being subjected to any pressure. According to the width of the blank to be handled at any one time, the side parts 37 are now adjusted in such a way that they are always located between the side flap folds, and the gaps 38 of the side parts always form continuations of gaps 38 of the central part, and the dimensions of the gaps are such that they accommodate the gummed strips of the greatest possible number of sizes of blanks handled by the machine. On the other hand the conveyance of the blanks between the rollers 33, 34 must be positive and continuous, and in order to accomplish this, the points 38' of the side part gaps which follow while the roller is revolving, must already have again seized the blank before it is released by the advancing point 36' of the central part 36. The two parts 39 serve only as supports or guides to bear upon the lower roller 33, and do not engage even the widest blank.

Between the next pair of rollers 40, 41 the bottom flaps which are at the leading ends of the blanks are turned over, folded and caused to adhere to the side flaps after having been first bent up on their previously formed crease or score by means, known in themselves, which are of no importance for this invention, and a folding knife 42 ensures the proper insertion of the bottom flap fold between rollers 40, 41. For the manufacture of sharply folded envelopes it is sufficient to so interrupt the circumference of the upper roller 40, by means of grooves crossing each other so that the pressing down of the bottom flap against the adhesive takes place only in closely adjacent places in order to avoid a squeezing out of the paste. Moreover, this surface interrupted by grooves must lie lower by a slight amount than the other surface of the roller so that the pasting pressure may not be too strong. So as not to impair the positive guidance of the work-pieces by this lowering of the roller circumference traversed by grooves, a strip free from grooves running all around the circumference and which has the normal diameter of the roller, is left in the center of the roller, i. e. where it runs over the part 43 of the envelope (see Fig. 12) which is free from adhesive.

In the manufacture of loosely folded goods however, provision must be made to avoid any sharp pressing of the bottom flap fold which is formed between them as well as of the previously formed side flap folds, with all sizes or shapes of envelopes. Regardless of this, moreover, it is necessary that the bottom flap fold receives pressure extending throughout its entire length and adequate to the desired looseness of the fold, and the fastening down of the bottom flap must also be dependable. Finally the fine and sensitive paper grades generally used for loosely folded envelopes do not permit of a sharp pressure such as is exercised, at the part 43 (Fig. 12—where the paper lies threefold on top of each other), by a grooveless strip of the roller which alone performs the task of feeding here, because this would result in marking or grooving the paper. In order to meet all these requirements and prevent the last mentioned drawback, the following arrangements are provided according to the present invention:

In order to avoid a sharp pressing of the bottom flap fold formed between the rollers 40, 41 a groove 44 running in the longitudinal direction of the lower roller 41 is provided in the surface of said roller, one side of such groove 44 having a radially disposed edge as shown, (see Fig. 1 and Figs. 7 and 11). With the approximate position of the rollers 40, 41 as shown in Figs. 1 and 11, the loose fold of the bottom flap enters into the space formed by the said groove 44 between the two rollers, so that tight or sharp folding is avoided when the rollers continue to turn. As the roller 41 makes one revolution for each blank, it always assumes the same position at the arrival of each blank, and by suitable regulation of the roller 41 a greater or lesser pressure of the bottom flap fold can be attained by reason of the tapered cross-sectional formation of the groove 44. If when the blank is received the roller 41 assumes the position shown in Figs. 1 and 11 the pressure of the fold is smallest, but if it is in a position turned further to the right, the sharpness of the fold increases with the degree of the turn.

In order to avoid a sharp pressing of the already finished side flap fold, the upper roller 40 comprises several parts, the central part 45 (Fig. 7) of which remains centrally disposed for all sizes of blanks while the roller parts 46 on both sides of it can be displaced on the shaft 40', according to the size to be handled, so that a sharp pressing

of the side flap folds is avoided at all times. With certain sizes some of the parts 46 are located outside of the blanks and are not used, the parts 46 being moved apart so as to provide intervening spaces to suit the blank width. In order to avoid marking of the bottom flap fold due to the gaps or spaces between the parts 46 and in order to ensure an equal pressing of the bottom flap fold, roller parts 47 which serve as supports or guides are also provided with this roller 40 at its two ends and remain in their position on the shaft 41' at all times, and fixed in them is a longitudinal cross-piece or bridge 49 which extends through gaps 48 of all the roller parts 45, 46 and 47, so that a uniform uninterrupted engagement of the bottom flap fold throughout its entire length is ensured.

The parts 45, 46 are formed with cross grooves 50 which serve to prevent a squeezing out of the adhesive for the bottom flap gumming, the only interruption in this grooved section being at 51 at the center of the roller part 45. In order to reduce the pressure exerted on the bottom flap, the circumference of the roller parts 45 and 46 traversed by the grooves 50 is slightly deeper than the rest of the circumference and than the part 51, which latter consists of a rubber ring inserted in the part 45 and adapted to prevent marking or glazing the surface of the paper used for loosely folded goods at the place 43 (Fig. 12) as a result of the threefold paper layer. For receiving the rubber ring 51 a suitable groove is recessed into the central roller part 45.

The turning over and folding of the closing flap of the envelope takes place in the manner customary with roller folding machines of the kind in question, in such a way that the bottom flap folded edge which is the first to leave the rollers 40, 41 is received by a guiding plate 52 which, as indicated by dotted lines in Fig. 1, moves up and down intermittently at the speed at which the work is handled. The blank is thereby led upwardly by the guiding plate 52 until its closing flap fold has left the rollers 40, 41. As the guiding plate 52 thus moves upwardly it is at the same time swung in such manner that it assumes the position shown by dotted lines in Fig. 1 and thereby releases the envelope with its closing flap fold now lying in position for introduction between rollers 53 and 41. The direction of movement of the envelope then changes and a swinging folding knife 54 effects the proper introduction of the envelope between the rollers 53, 41. In order that, during the passage of the work between these rollers, a sharp pressing of the closing flap fold and of the already existing side and bottom flap folds is avoided, the roller 53 has the special form shown at Figs. 9, 10 and 11. With the exception of a segment 55 and the supports or guides 56 whose height or diameter corresponds to the roller diameter proper, the entire circumference of the roller is made deeper by an amount which corresponds to the desired degree of the looseness of the folds. While the parts 56 ensure the proper distance of the elastically supported roller 53 from the roller 41, the segment 55 serves to convey the blank. This segment 55 is smaller in length and width than the smallest size of blank to be handled in the machine and its surface corresponds approximately to the rectangle drawn in dotted lines in Fig. 12, if it is assumed that the work shown in this illustration represents the smallest size to be handled. The roller 53 is adjusted in such a way that it seizes the blank passing between it and its counter-roller by means of the leading edge 57 of segment 55 at such a distance behind the closing flap fold that sharp pressing of such fold is avoided, but this fold like all the others is subjected, through the deepened circumference of the roller, to the gentle pressure corresponding to the desired degree of looseness. As the enevelope slides by gravity over the oblique plate 58 behind the rollers 53, 41, the conveyance effected by the segment 55 is sufficient even with larger sizes, the more so as with larger sizes the side folds are still subjected to light pressure, with a conveying effect, between the deepened part of the roller 53 and its counter-roller 41.

The finished envelope is received between a lifting disc pair 59 and its counter-rollers 60 known in themselves, which convey it in such manner that it is brought between the said lifting discs 59 and a curved guide 61 spaced around the latter. In this position the envelope is engaged by cams 62 fastened to the disc pair 59 at its bottom flap folding edge which now lies in the rear (see Fig. 13), and it is thus pushed through the slot 61' between the discs 59 and the said guide 61, until it is brought with its bottom flap folding edge on a level with a receiving band 63. As soon as it has reached this position, it is pushed off in the well known manner from the cams 62 by an arm 64 swinging in rhythm with the handling of the work, so that it rests with its bottom flap folding edge on the said band 63 and at the same time bears with its back against a stacking disc pair 65 which, in the well known manner, feeds the envelope to the stack.

In order to avoid the application of undue pressure to the uniformly loose folds within this stacking device, special provision has been made.

The closing flap fold which is in advance and passes between the hoisting discs 59 and their counter-rollers 60 would be subjected to pressure by the rollers 60 with consequent interruptions in the looseness of the folds if the rollers 60, as is permissible with the manufacture of sharply folded goods, were per-

mitted to bear permanently upon the discs 59. For that reason the rollers 60 are lifted at the moment when the closing flap fold is received if loose fold envelopes are being made. For this purpose a lever 70 is attached to a shaft 68 which carries the bearing levers 69 of the rollers 60, and carries at its free end a roller 71 which, under the action of a tension spring 72 bears against a cam 73 attached to the shaft 59′ of the discs 59. For each revolution of the hoisting discs 59 these convey, in the example drawn, three envelopes to the stack 66 and consequently the rollers 60 are also lifted three times for each revolution of the cam 73 at the right moment in such manner that the closing flap fold can pass uninjured between the rollers 60 and the hoisting discs 59.

In order also to prevent injury of the following bottom flap fold between the hoisting discs 59 and the rollers 60, recesses 74 are arranged in the outer peripheral surfaces of the discs 59, in front of their hoisting cams 62, and these recesses 74 are sufficiently deep to receive the loose bottom flap fold of the work W (Fig. 13). Moreover the rollers 60 are prevented from entering the recesses 74 when passing over them. For that purpose the levers 69 are provided with an arm 75 which has a contact surface engaging against a set screw 77. In this manner the movement of the levers 69 and of the rollers 60 resting thereon can be limited in such manner that while bearing sufficiently on the periphery of the discs 59 to ensure a positive conveyance of the work, they are unable to enter the recesses 74.

In order to prevent an unduly strong pressure even in the stack 66, the band 63 carrying the stack 66 and the stop 67 supporting the envelopes are driven by suitable feed mechanism capable of convenient regulation according to the increase in the stack, so that only a slight and uniform pressure is applied to the goods.

Although the drawings and above specification disclose the best mode in which we have contemplated embodying our invention, we desire to be in no way limited to the details of such disclosure for in the further practical application of our invention, many changes in the form and construction may be made as circumstances require or experience suggests without departing from the spirit of the invention within the scope of the appended claims.

What we claim is:

1. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for folding and gumming the flaps and rotary feed means comprising a plurality of members each having a cylindrical section for conveying the blanks and a tapered or conical section for engaging the loose folds in the blank.

2. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for folding and gumming the flaps of the envelopes and rotary means for positively feeding the envelope blanks comprising a central member, a rubber ring thereon and a plurality of side members adjustable relatively to the said central member.

3. A roller folding machine of the character described for the manufacture of loosely folded envelopes comprising means for folding and gumming the flaps, a feed roller having parts adjustable relatively to each other and a cooperating roller having an axial groove therein to accommodate a fold in the envelope blank.

4. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for folding the envelope flaps, means for applying the gum to the flaps and a series of sectional rollers for positively feeding the blanks without exerting pressure upon the folds, including a roller with relatively movable sections having angular gaps therein for receiving the gummed portions of the blanks.

5. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising blunt knives for scoring or creasing the blanks in a transverse direction for the bottom and closure flaps, rails for use in forming longitudinal folds, means for folding the side flaps upon said rails, means for applying the gum to the flaps, and conveying means with gaps therein and swinging feed rolls for feeding the blanks without exerting pressure upon the folds.

6. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for folding the flaps and means for conveying the blanks through the machine which comprise rotary members adjustable to suit envelopes of varying shapes and sizes, gaps therein for the accommodation of the said folds, a crosspiece or bridge connecting said members across said gaps, and a rotary member cooperating with said members and said bridge to feed the blanks.

7. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for folding and gumming the flaps and rotary feed means comprising a plurality of axially adjustable members each having a cylindrical section for conveying the blanks and tapered or conical sections for engaging the loose folds in the blank with light pressure variable according to the axial adjustment of said members.

8. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for folding and gumming the flaps, an adjustable feeding roller with circumferential gaps therein for the accommodation of the longitudinal folds in the blanks, and a cooperating roller having a longitudinal groove for the accommodation of the transverse folds in said blanks.

9. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for folding the flaps, means for the application of gum to the flaps and rotary means for conveying the blanks positively through the machine without contacting with the exposed gummed portion and without exerting undue pressure upon the folds in the blanks, comprising a roller having a raised segment for engaging the envelope only within the longitudinal and transverse folds of the smallest size of envelope, and a recessed surface for engaging the loose folds with uniform pressure throughout.

10. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for folding and gumming the flaps of the envelopes, and rotary means for positively feeding the envelope blanks comprising a central circumferentially grooved member, a plurality of side members adjustable relatively to the said central member, a resilient ring in said groove, and a cross-piece or bridge connecting said central and side member.

11. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising blunt members for creasing or scoring the blanks, means for folding and gumming the flaps, a feed roller having parts adjustable relatively to each other and a cooperating roller having an axial groove therein to accommodate the leading transverse fold in each envelope blank.

12. A roller folding machine of the character described for the manufacture of loosely folded envelopes, comprising means for applying gum to the envelope flaps, feed rollers for conveying the envelope blanks without exerting undue pressure on the folds, rotary members for conveying the envelopes from the machine, rollers cooperating with such members to feed the envelopes and means for moving such rollers to and from the members to permit the passage of the loose folds.

13. A roller folding machine of the character described for the manufacture of loosely folded envelopes comprising means for folding the envelope flaps, means for applying gum to the flaps, rollers for positively feeding the blanks without exerting undue pressure upon the folds, rotary conveyor members for the completed envelope, gaps therein for the reception of the loose folds, rollers cooperating with said member to feed the envelopes, and means for preventing the roller from entering said gaps.

In testimony whereof we have signed our names to this specification.

ALFRED WINKLER.
MAX DUNNEBIER.