Dec. 1, 1931. A. WINKLER ET AL 1,834,664

ROLLER FOLDING MACHINE FOR THE MANUFACTURE OF ENVELOPES

Filed Aug. 23, 1930 3 Sheets-Sheet 1

Fig. 1

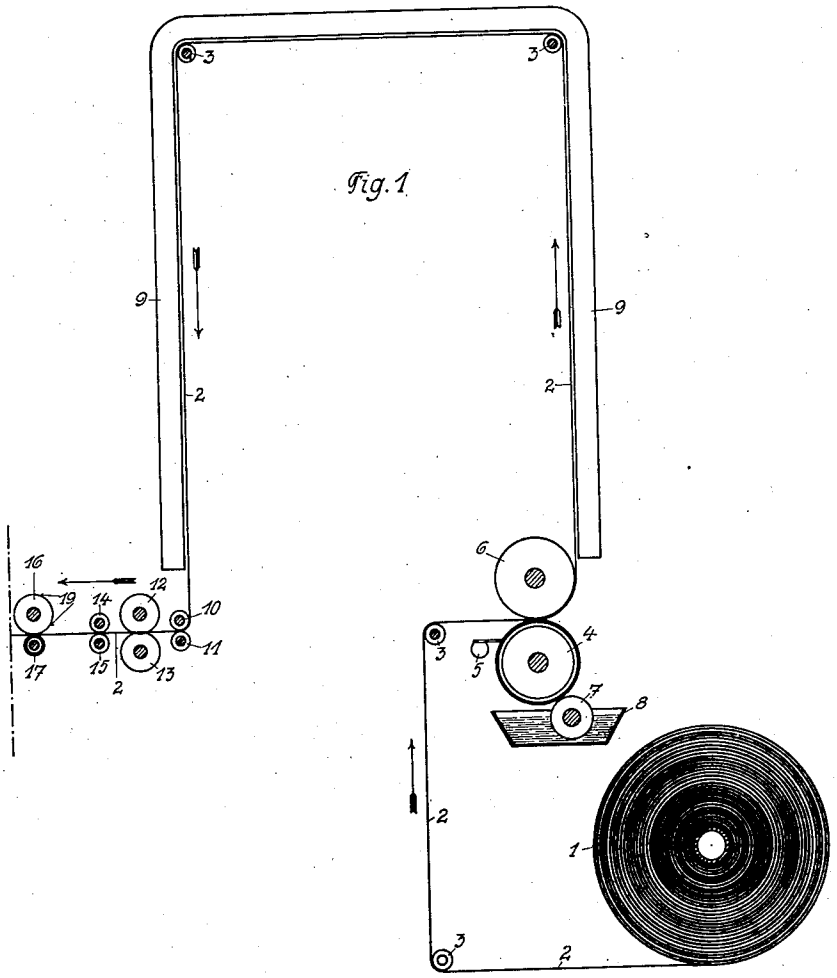
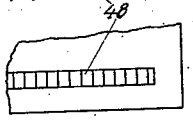


Fig. 4



Fig. 5



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ROLLER FOLDING MACHINE FOR THE MANUFACTURE OF ENVELOPES

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Fig. 1a

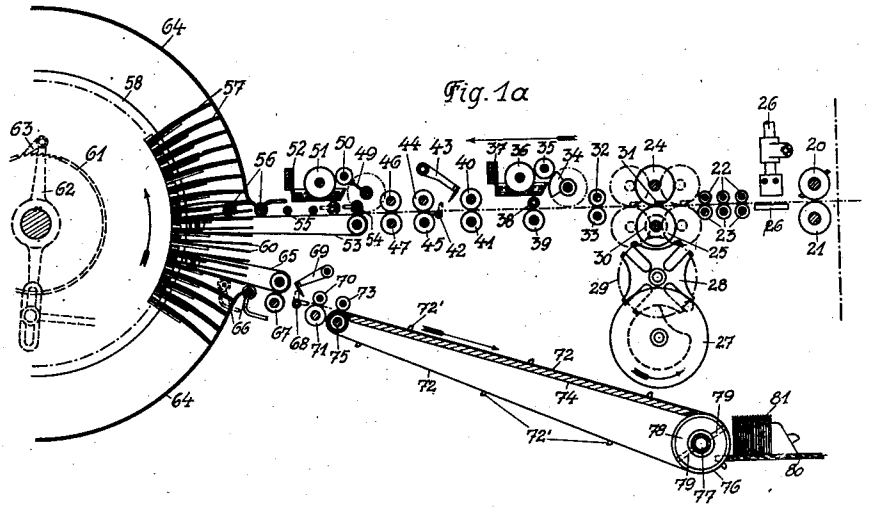


Fig. 2

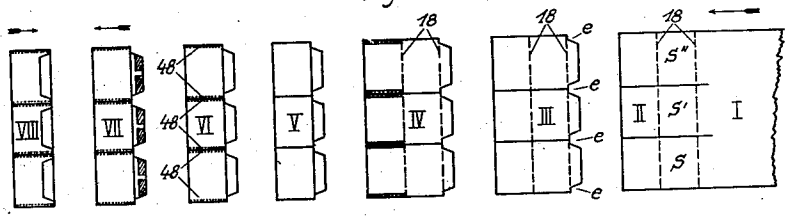
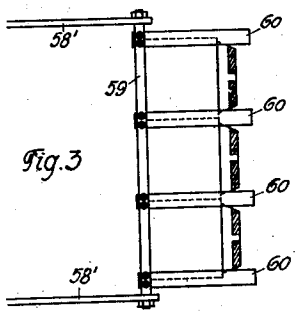


Fig. 3



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ROLLER FOLDING MACHINE FOR THE MANUFACTURE OF ENVELOPES

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Fig. 6

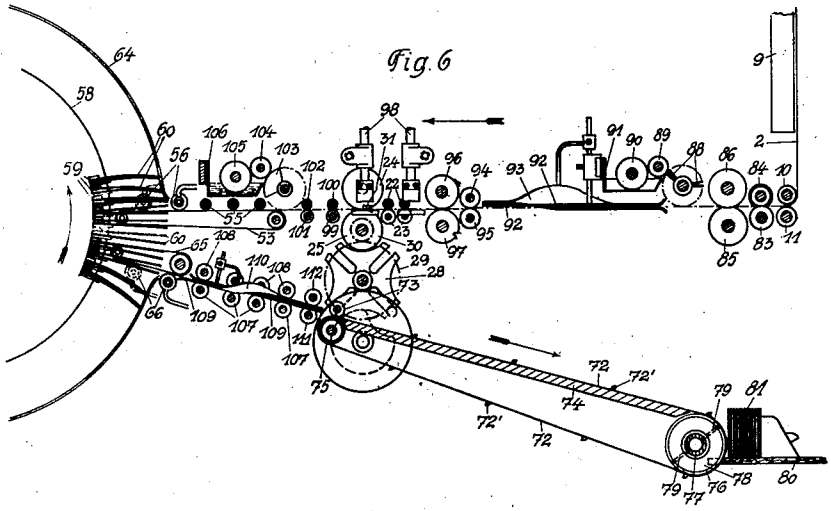


Fig. 7

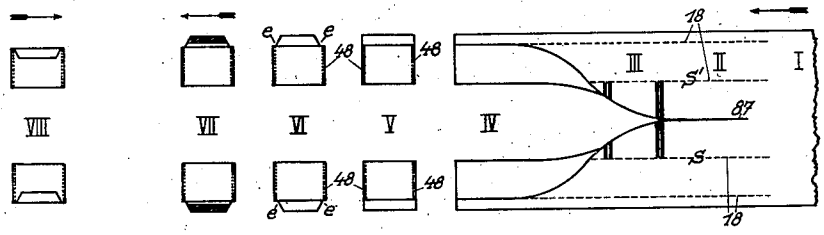
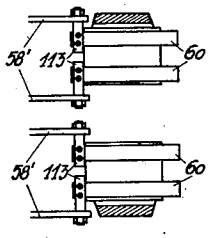


Fig. 8



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UNITED STATES PATENT OFFICE

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ROLLER FOLDING MACHINE FOR THE MANUFACTURE OF ENVELOPES

Application filed August 23, 1930, Serial No. 477,259, and in Germany July 31, 1929.

This invention relates to a roller folding machine, preferably fed from a paper roll, and intended for the manufacture of envelopes, having a bottom and a closure flap fold, but no side folds, and in which the lateral or side closing is effected by pasting to each other the side edges of the front and back parts.

One object of the present invention is to provide a machine whereby a paper strip—fed from a paper roll—is divided into a plurality of longitudinal strips from each of which envelopes of the above type are simultaneously produced.

Machines of this character are already known for the manufacture of envelopes having narrow strips bent over inwardly along the side edges of their front and back parts, the strips of the front part being pasted on the back parts while the strips of the back part remain loosely folded towards the same, and, for the purpose of lateral closing, are pasted only to the strips of the front part.

A further object of the present invention is to provide means to fold and paste the envelopes complete with the exception of their closing flaps and to effect the application of the gum on the said flaps, and to provide adjacent thereto a drying wheel equipped with a number of work carriers individually receiving the work series. A still further object is the provision of means whereby this drying wheel, after receiving a series of envelopes turns through approximately 360 degrees, and whereby the envelopes are then removed from the said wheel with the gum dried upon the closure flaps which are only then folded upon the envelopes, the completed envelopes being received and accumulated in an upright position in a suitable stack. A still further object of this invention is to provide the drying wheel with means whereby the envelopes may be delivered therefrom above or below the level at which the envelopes are fed to such wheel. A still further object is the provision in the said drying wheel of envelope holders comprising spring members arranged in pairs to receive the envelopes therebetween and rails adapted to cooperate with said holders to close the same to retain the envelopes in the wheel, said rails being shaped so as to release the said holders to permit the introduction of the envelopes into the wheel and to permit the delivery of the envelopes after the drying operation.

With these 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 may be made without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings which show two distinct forms of the machine, Fig. 1 is a diagrammatic side view showing the right hand part of one form of the machine; Fig. 1*a* is a similar view showing the left hand part of the same machine; Fig. 2 is a diagram showing eight successive stages in the manufacture of the envelope from a paper strip divided longitudinally into three equal parts; Fig. 3 is a plan view of a holder provided in the drying wheel for the reception of three envelopes; Figs. 4 and 5 are respectively edge and plan views showing the corrugations or impressions in the gummed side edges of the envelopes; Fig. 6 is a view corresponding to Fig. 1*a* showing another form of the machine; Fig. 7 is a view corresponding to Fig. 2 but showing eight stages in the manufacture of envelopes by the machine shown at Fig. 6 from a paper strip divided longitudinally into two equal parts, and Fig. 8 is a plan view of an envelope holder for use in the machine shown at Fig. 6 for the accommodation of two envelopes.

Referring to Figs. 1 and 1*a* assembled together along the broken line at the left hand side of Fig. 1 and along the similar line at the right hand side of Fig. 1*a*, the paper strip 2 is unwound from paper roll 1, passes around guide rolls 3 in the direction of the arrow to suitable printing mechanism diagrammatically indicated on the drawings by a form cylinder 4, a doctor or drop roller 5, an impression cylinder 6, an inking roll 7

and an ink supply trough 8. From the printing mechanism, the paper strip 2 passes through a suitable drying apparatus 9 and passes from thence between a roller pair 10, 11 from which the strip is delivered in a horizontal plane and is received by rotary cutting knives 12, 13 for cutting the strip in a longitudinal direction and sub-dividing it into three longitudinal parts or strips *s*, *s'*, *s''* of equal width—see Fig. 2—I and II. These sub-divided strips are received by conveying rolls 14, 15 by which they are fed to preliminary creasing rolls 16, 17 whereby the creases 18—see Fig. 2—III and IV, are formed throughout all three of the strips thus forming the initial creases for the bottom and closure folds. The upper roll 16 is provided for this purpose with suitable knives or ridges 19 while the lower roll 17 is provided with a rubber covering.

The strips *s*, *s'*, *s''* are received between rotary cutting devices 20, 21 of any suitable or well known type by means of which the said strips are severed into sections of equal length appropriate to the size of envelopes being manufactured. During this cutting operation the paper is located between the rollers 23 and their counter rollers 22 by means of which the pieces of paper are fed to the roller pair 24, 25 after the severing operation, but before the said pieces are seized and conveyed onward by the said roller pair 24, 25, they are temporarily brought to rest to permit the cutting away of the corners *e*—Fig. 2—III by means of the intermittently operated cutting device 26. For this purpose the said rolls 23 are positively driven at a higher circumferential speed than that of the other feeding rollers while the counter-rollers 22 run idly upon the paper between them and the rollers 23 in such manner that the pieces of paper are conveyed between the rollers 22, 23 only when there is no resistance to such conveyance and when any resistance occurs the rollers 23 continue to turn in sliding contact with the under-surface of the paper while the counter-rollers 22 remain without rotation. The roller pair 24, 25 is intermittently operated by the Maltese gear 27, 28 through the medium of the spur gear 29, 30 in such manner that the said rollers make a complete revolution between each stoppage, one revolution—including one stoppage—corresponding to one revolution of the continuously rotating roll wheel 27 of the said Maltese gear. The upper roll 24 is provided in its circumference with a gap 31 extending axially throughout its length and having one side extending in a radial direction. The adjustment of the upper roller 24 is such that this gap 31 occupies the position shown at Fig. 1*a* of the drawings when the rolls 24, 25 are at rest. The pieces of paper are consequently guided with accelerated speed by the said rolls 23 and their counter-rolls 22 into the space thus formed between the rolls 24, 25 until the front edges of the said pieces engage the radially formed front walls of the said gap 31 and the resistance caused by this engagement brings the said pieces temporarily to rest in proper timed relation to the operation of the cutter 26. The rollers 24, 25 then make one revolution so that the paper pieces are fed forward thereby. The above described operation of the rollers 23 and their counter-rollers 22 also ensures that the operation of the cutting rollers 20, 21 may be permitted in spite of the increased speed of the under-rollers 23 which have already engaged the strips of paper before the completion of the cutting operation by said rollers 20, 21.

In Fig. 1*a* of the drawings the rollers 24, 25 are shown in dotted lines in adjusted positions to suit the largest as well as the smallest envelope size that may be handled by the machine and this adjustment of the position of the rollers 24, 25 may be effected in any suitable or well known manner.

From the rollers 24, 25 the paper or sheets which are now shaped as shown at Fig. 2 III are received by conveying rolls 32, 33 which feed them forward to a device for the application of the adhesive for the side gumming of the sections indicated by hatched lines at Fig. 2 IV. This device consists of gumming members 34 adapted to engage a gum carrying roller 35 which engages a gum lifting roller 36 mounted in the gum or adhesive container 37 and this device operates in the well-known manner to apply the gum in the form described.

The gummed paper pieces are received between rollers 38, 39 and are conveyed thereby to rollers 40, 41, the upper rollers 38, 40 being recessed to avoid smearing of the gum on the upper surfaces of the said pieces and as they advance beyond the rollers 40, 41 the pieces have their bottom flaps folded over in the well known manner by means of a swinging member 42 which bends up the back parts of the envelopes upon the previously formed crease 18 which is then engaged by a swinging folder knife 43 which effects the proper entry of this fold between a pair of folding rolls 44, 45.

The blanks are now in the condition according to Fig. 2 V and are thus received between a roller pair 46, 47 having fluted or corrugated surfaces for forming corresponding impressions or corrugations 48—Fig. 2 VI—in the blanks to ensure adhesion of the side gumming. In Figs. 4 and 5 a portion of a blank is shown with the impressions or corrugations 48 exaggerated for the purpose of illustration.

From the said rolls 46, 47 the blanks or envelopes pass beneath means for the appli-

cation of the gum to the closure flaps according to the hatched surfaces at Fig. 2 VII. This gumming operation is effected by the mechanism 49, 50, 51, 52 which is similar to the side gumming mechanism 34, 35, 36, 37 hereinbefore described. The envelopes are then conveyed by the bands or belts 53 and cooperating counter rollers 54. The circle described by the gumming wings 49 must have a circumference that even for the largest size of envelopes there is one revolution of the gumming wing for each operation and clear space must therefore be provided for its revolution so that it is not possible to mount the rollers 54 in a fixed location to provide positive conveyance of envelopes of even smallest dimension. The rollers 54 are therefore moved backward and forward horizontally upon the bands 53 by means well known in the art in such manner that their extreme backward position as indicated in full lines at Fig. 1*a* enables them to seize the envelopes by the bottom folded edges thereof, and these rollers 54 then move forward with the envelopes so as to permit—when in the extreme forward position as shown in dotted lines—the gumming wings 49 to complete their revolution whereupon the said rollers return into position for the reception of the next succeeding envelopes. The motions of the rollers 54 and the gumming wings 49 are so coordinated that the rollers move forward to seize the envelope being fed by the rolls 46, 47 when the gumming wings are in their upper or gum-receiving position (Fig. 1*a*). As the gumming wings turn to gumming or stamping position, the roller 54 moves to its forward position, thereby positioning the envelope and clearing the path of the wings. The belt 53 then serves for further conveying of the envelope, but such a belt is not in itself enough to draw the envelopes from the rolls 46, 47 and the rollers 54 must be provided for this purpose. Rolls 55 loosely mounted on the conveying belts 53 feed the envelopes beneath rollers 56 which are adapted to move backwardly and forwardly in the same manner as the rollers 54. The movement of these rollers 56 permits the introduction of envelopes of any size into work-holders 57 of a rotary drying wheel 58 and at the same time permits the envelopes to pass by the rollers during the revolution of the said drying wheel. All the rollers 54, 55 and 56 which cooperate with the conveyor bands 53 engage the envelope at parts which are free from gum and in order that certain upper rolls may engage the center line of the envelopes for the purpose of positive conveyance, a narrow strip at the center of the closure flap may be left free from gum as shown at Fig. 2 VII and at Fig. 3.

The drying wheel 58 comprises a pair of discs 58′—see also Fig. 3—carrying cross members 59 mounted at equal distances apart and having outwardly projecting spring arms 60 arranged in pairs and adapted to be so bent with respect to each other that in their natural position they leave sufficient space for the free introduction and discharge of the envelopes whereas they positively grip the envelopes when they are compressed and bent by a guide rail 64. Fig. 3 shows that the arrangement of the arms 60 is such that the conveying bands 53 can be extended down far into the envelope holders so that the envelopes engage the said cross pieces 59. The said wheel 58 may be rotated continuously or intermittently; in the axample shown it is assumed that on the shaft of the said wheel a feed gear wheel 61 is secured and has teeth corresponding in number to the number of work holders in the wheel and a pawl 63 is mounted on a rocking arm 62 and is adapted to impart step by step movement to the wheel. The arrangement is such that each time one of the cross pieces 59 with the work holders 60 is in proper position with the wheel temporarily at rest, the envelopes are fed by the bands 53 and rollers 56 into the holders 60 and as the wheel is intermittently rotated in the lirection of the arrow, the holders 60 containing the envelopes are engaged by the inner surface of concentric rails 64 in such manner that the arms or holders 60 are bent or flexed so as to retain the envelopes in position between them.

The fact that the envelopes are held tightly in bent or curved form while the gum is drying prevents the curling often caused by the contraction of the drying gum. The resulting product is more satisfactory as the dried gum cannot cause such curling even after the pressure is released.

Closely located beneath the bands 53 are receiving bands 65 also extending into the spaces between the envelope holders and so arranged that each time the drying wheel is brought to rest, one of the cross pieces 59 with its work holders is in alignment with the lower strand of the conveying belt 65 and at this moment rolls 66 cooperating with the band 65 move into the space between the said holders and press the envelopes into engagement with the lower strand of the belt 65 so that the envelopes are fed from the drying wheel and are received between the belts 65 and rollers 67.

By the belt 65 and rollers 67 the envelopes are fed to a folding lever 68 by means of which the closure flaps are swung upwardly upon the previously formed crease 18 which crease is then engaged by a swinging knife 69 whereby proper entry of this fold is effected between folding rolls 70, 71.

As the envelopes leave the folding rolls 70, 71 they are received between a counter-roller 73 and a conveying band 72 and are thus distributed on a sliding track 74 as they pass beneath the rolls 73. Upon the track 74 the en-

velopes are engaged at their bottom fold edges by conveying cams 72′ attached to the conveying band 72 and are thus caused to traverse the track 74. The conveying bands 72 are guided around a roll 75 and around discs 76, the latter of which are mounted on a hollow shaft 77 and between these discs 76 are special discs 78 mounted on the same shaft and having suction channels 79 communicating with the center of the hollow shaft 77 and with the circumference of these discs and by means of suitable or well known control devices for the suction the envelopes are held by the suction openings of the discs 78 in the vicinity of their closure flap folds as soon as they have come above said opening. They are thus conveyed by the discs 78 and brought into the vertical position and when the closing flap folding edge has in this manner reached a distributing table 80 the suction is cut off so that the envelope is again released by the discs 78 and each envelope thus falls into line in one of the three stacks 81 lying alongside of each other. Around the drying wheel 58 heating means of any suitable or well known type may be provided in order to effect quick drying of the gum on the closure flaps so that a relatively small diameter of wheel is sufficient for the drying operation. This arrangement of drying wheel and of work holders 60 permits the construction of a wheel with the holders therein arranged as close together as possible so that the wheel is of minimum size and the length of the machine is thus reduced; and the arrangement whereby the envelopes are received from the wheel in the opposite direction also tends to reduce the length of the machine.

Referring to Figs. 6, 7 and 8 which relate to a modified form of the machine, the blanks or envelopes are conveyed through the machine in the direction of their bottom and closure folds instead of in the direction of their sides as in the machine previously described. The printing mechanism may be similar to that described with reference to Fig. 1 and a portion of the drying apparatus 9 for the strip 2 is shown at the right hand side of Fig. 6 while the rolls 10, 11 bring the strip into a horizontal plane. From the rolls 10, 11 the strip is received between rolls 83, 84 which form longitudinal preliminary creases 18 for the bottom and closure folds—see Fig. 7—II, III. From the rolls 83, 84 the strip is received by longitudinal cutting devices 85, 86 by which the strip is cut into the desired number of longitudinal parts. In the present case the strip is cut into two equal parts s, s' and the outside edges of the original paper strip form the outer edges of the closure flaps of the envelopes while the parts between the central intersecting line 87 and the innermost creases 18 form the back parts of the envelopes. The strips thus formed are provided by means of the gumming device 88, 89, 90, 91 with the adhesive for the side gumming as indicated at Fig. 7 III by the hatched parts. The strips s, s' are then bent up and turned over upon the folding rails 92 by means of the folding curves 93 so as to fold upon the bottom crease 18 and the folded strips are received between a roller pair 94, 95 which press the bottom fold and effect the side pasting. In this form of the machine the work is therefore already pasted complete before it is separated into individual envelopes from the longitudinal strips of paper.

The separation of the individual units or envelopes and the simultaneous application of the corrugations 48 hereinbefore described is effected between the cross-cutting devices 96, 97 so as to produce the parts Fig. 7 V.

By means of the devices 98 the side cutting of the closure flaps is effected—see Fig. 7 VI. For this purpose the blanks must be brought temporarily to rest and this is effected by the same means as described in connection with Fig. 1*a*. This mechanism consists of intermittently operated rolls 24, 25 one of which has a longitudinal gap 31 in combination with the accelerated rolls 23 with counter-rolls 22 running loosely thereon. The rolls 24, 25 together with one of the corner cutting devices 98 i. e. that at the left in Fig. 6 must be adjusted to accommodate different sizes of envelopes but for the sake of clearness this adjustment is not shown on the drawings.

The blank is now conveyed by rollers 99, 100 and 101, 102 beneath the gumming mechanism 103 to 106 for the application of gum or adhesive to the closure flaps and from thence the envelopes are fed by the conveying band 53 and the rollers 55 and 56 thereon to the holders 60 of the drying wheel 58 in the manner above described and after the wheel has turned through approximately 360 degrees the envelopes are removed by the conveyor band 65 and its cooperating rollers 66 which cooperate with a conveying track formed by a plurality of roll pairs 107, 108 between which the turning over of the closing flaps is effected upon folding rails 109 by means of folding curves 110 after the gum has become thoroughly dry. The roller pair 111, 112 press down the closure flaps of the envelopes and effect the delivery of the envelopes to the mechanism 73 to 81 whereby the envelopes are stacked in the manner hereinbefore described with reference to Fig. 1*a*.

Fig. 8 shows a modification of the drying wheel 58 in which a set of four individual discs 58′ are provided and may be adjusted relatively to each other in the longitudinal direction of the shaft upon which they are carried. Each of these discs 58′ carries a bracket 113 to which is secured a pair of spring members 60 and in this manner the holders 60 can be set or spaced to suit the dimensions of the envelope being handled and

may be clamped by any suitable means on the carrying shaft.

Although the drawings and the above specification disclose two of the best modes 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 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 for the manufacture of envelopes having front and back parts connected together without side folds comprising means for the application of gum to the side edges of the envelope, means for the application of gum to the closure flaps of the envelopes and a drying wheel having resilient means for holding and bending the envelopes fixedly mounted on the periphery thereof, means for delivering the envelopes to one side of the wheel and means for receiving the bent envelopes from the same side of the wheel after the drying operation.

2. A roller folding machine for the manufacture of envelopes with front and back parts connected to each other without side folds comprising means for feeding a continuous strip of paper, means for separating the strip into longitudinal parts, means for separating said parts transversely into sections, means for forming the closure flaps of the envelopes, intermittently rotated rolls comprising means to serve as stops for said sections, to facilitate the formation of the closure flaps, means for the application of gum to the flaps and a drying wheel receiving and delivering the envelopes at the same side thereof.

3. A roller folding machine for the manufacture of envelopes having front and back parts gummed together without side folds comprising means for the formation of a series of parallel rows of envelopes, means for the application of gum to the closure flaps of the envelopes, a drying wheel for receiving the envelopes, spring holding devices in said wheel, cross pieces carrying said devices and a fixed rail engaging said devices and concentrically arranged with respect to the wheel to bend and close said spring devices to hold the envelopes therein.

4. A roller folding machine for the manufacture of envelopes with front and back parts connected to each other without side folds comprising means for feeding a continuous strip of paper, means for separating the strip into longitudinal parts to form envelopes in a plurality of parallel rows, means for separating said parts transversely into sections, means for forming the envelope closure flaps on said sections, intermittently rotated rolls comprising radial surfaces serving as stops for said sections, means for the application of gum to the flaps, and a rotary drying wheel receiving and delivering the envelopes at the same side thereof.

5. A roller folding machine for the manufacture, from a continuous paper strip, of envelopes with front and back parts secured to each other without side folds comprising means for the formation of a plurality of parallel rows of envelopes, means for applying gum to the flaps of the envelopes, a drying member for drying the gum on the flaps, flexible means fixedly mounted on the drying member for engaging envelopes, means for bending said flexible means to grip an envelope and to hold the same in bent form, means for delivering the gummed envelopes to said drying member, and means for receiving the envelopes from said member after the drying of the gum and for folding the closure flap, said delivering and receiving means being arranged one above the other.

6. A roller folding machine for the manufacture, from a continuous paper strip, of envelopes having front and back parts gummed together without side folds comprising means for the formation of a plurality of parallel rows of envelopes, means for applying gum to the flaps of the envelopes, a rotary drying wheel to receive the envelopes, spring holding devices for the envelopes in said wheel, cross pieces carrying said devices and a fixed concentric rail engaging the outer extremities of said devices to bend and close said devices to hold the envelopes therein.

7. A roller folding machine for the manufacture of envelopes with front and back parts connected to each other without side folds comprising means for feeding a continuous strip of paper, means for separating the strip into longitudinal parts to form envelopes in a plurality of parallel rows, means for separating said parts transversely into sections, means for forming the envelope closure flaps on said sections, rolls comprising radial walls serving as stops for said pieces, high speed rolls for holding the pieces against said radial walls during the formation of said flaps, means for the application of gum to the flaps, and a drying wheel receiving and delivering the envelopes at the same side thereof.

8. A roller folding machine of the character described comprising rotary means for drying the gum on the flaps of a plurality of rows of envelopes, means for folding the closure flaps after the drying operation, a conveyor track for receiving the completed envelopes, cams for conveying the envelopes, means for moving said cams, discs for receiving the envelopes and suction devices in said

discs for bringing the envelopes to an upright position.

9. A roller folding machine for the manufacture of envelopes having side gumming of the character described, comprising means for the supply of a continuous strip of paper, means for separating said strip into longitudinal parts, means for forming the envelopes from said parts, means for the application of gum to the closure flaps of the envelopes, rotary means for drying said gum, means for closing the said flaps after the drying operation, and means for stacking the envelopes in parallel rows comprising an inclined conveyor track and a rotary member having suction means for engaging the envelopes and for bringing same to an upright position in the stack.

10. In a drying attachment for drying the gum on the flaps of envelopes, a conveyor, means mounted on said conveyor for holding an envelope, and means engaging the holding means to bend the envelope held thereby to prevent curling of the envelope.

11. In a drying attachment for drying the gum on the flaps of envelopes, a conveyor, pairs of fingers on said conveyor, the fingers of each pair being normally separated from one another, and means for moving said fingers together to grip and bend an envelope therebetween.

12. In a drying attachment for drying the gum on the flaps of envelopes, a conveyor, pairs of fingers projecting from said conveyor, the fingers of each pair being normally separated from one another, and means engaging said fingers to move them towards each other to grip an envelope therebetween and to bend the envelope held thereby to prevent curling.

13. In a drying attachment for drying the gum on the flaps of envelopes, a wheel, a plurality of pairs of fingers on the periphery of said wheel, the fingers of each pair being normally held in spaced relation, and a rail member partially encircling said wheel and engaging said pairs of fingers to press them together to grip an envelope therebetween.

14. In a drying attachment for drying the gum on the flaps of envelopes, a wheel, a plurality of pairs of fingers of resilient material on the periphery of said wheel, the fingers of each pair being normally resiliently held in spaced relation, and a rail member partially encircling said wheel and engaging said pairs of fingers to press them together to grip an envelope therebetween and to bend the fingers and the envelope held therein to prevent curling.

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

ALFRED WINKLER.
MAX DÜNNEBIER.