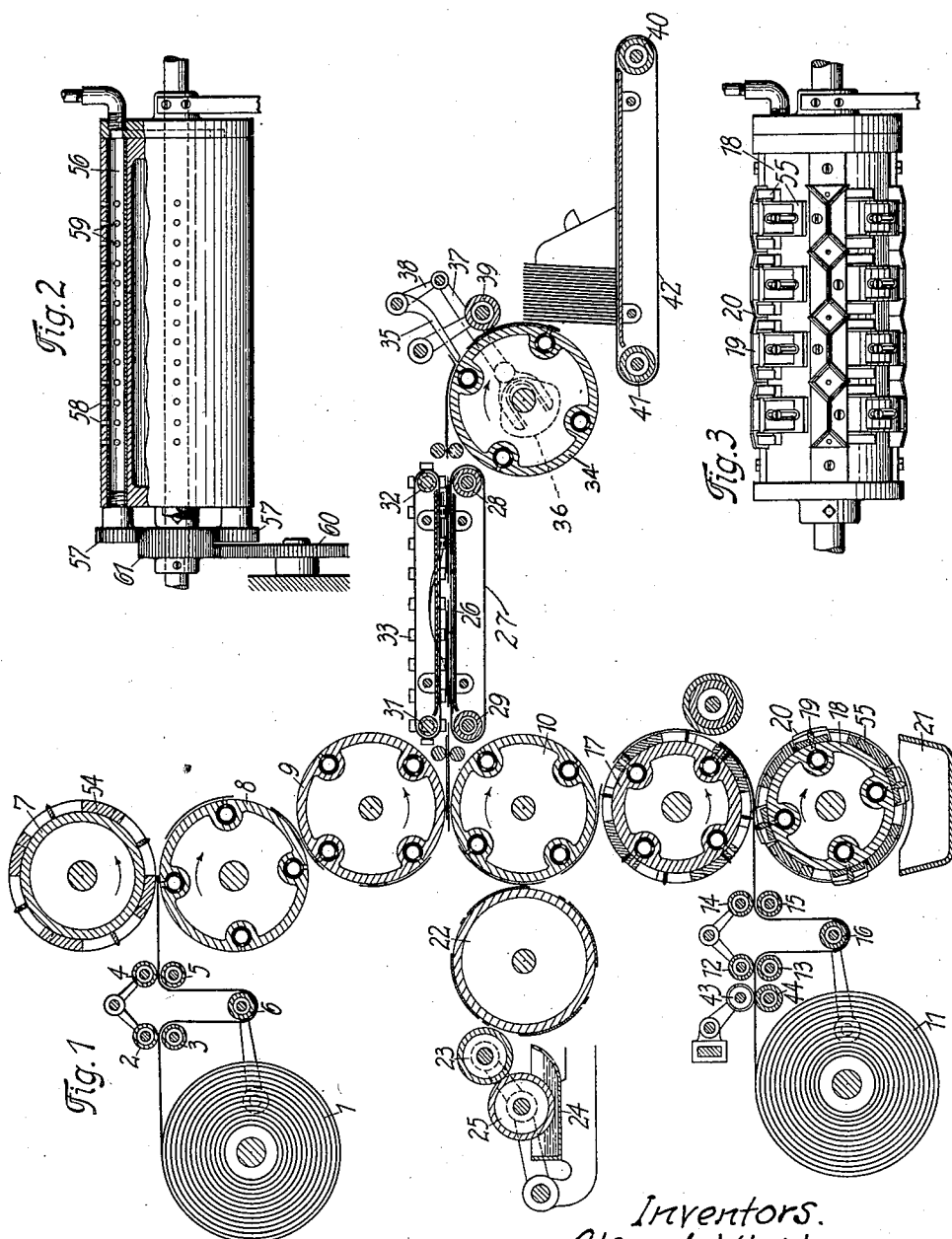


Oct. 26, 1943.

A. WINKLER ET AL
PROCESS AND MACHINE FOR THE MANUFACTURE OF ENVELOPES
OF PAPER OR SIMILAR MATERIAL
Filed June 26, 1940

2,332,544

3 Sheets-Sheet 1



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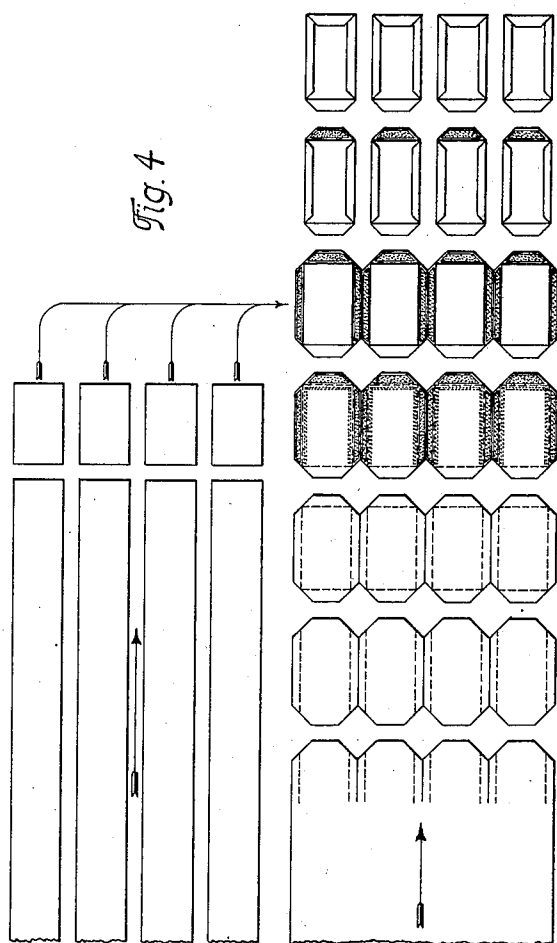
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Attorney.

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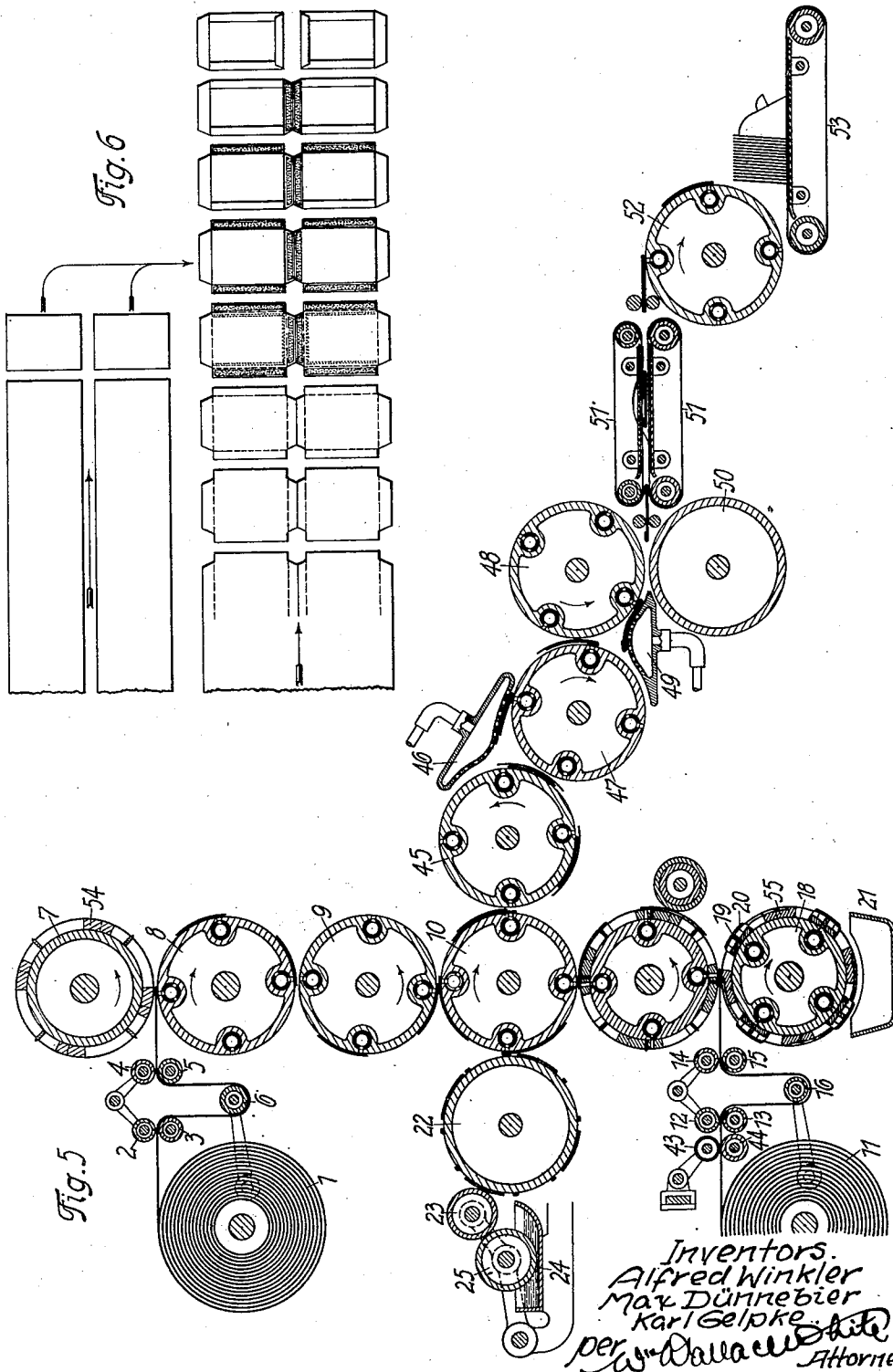
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Max Dünnebier
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per *Wm. Wallace* Attorneys.

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UNITED STATES PATENT OFFICE

2,332,544

PROCESS AND MACHINE FOR THE MANUFACTURE OF ENVELOPES OF PAPER OR SIMILAR MATERIAL

Alfred Winkler, Max Dünnebier, and Karl Gelpke,
Neuwied, Germany; vested in the Alien Property Custodian

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In Germany September 17, 1938

6 Claims. (Cl. 93—61)

The invention relates to a process and machine for the manufacture of safety envelopes of paper or similar material.

For the economical manufacture of envelopes, the process according to the invention is particularly well suited, for the reason that in connection with it the rectilinear operation heretofore customary in rotating machines of this kind is avoided and its place is taken by a working operation in which it is not single or individual roller pairs that effect the guidance of the blanks or articles. The conveyance of the blanks, according to the process of the invention, is effected rather by making the different sheets of paper adhere to the surfaces of the rollers, for instance, by suction.

Processes are already known in themselves in which two parts cut from paper rolls are likewise pasted together to form an envelope, but in which the working operation is rectilinear and in which the blanks are first separated from the strip of paper when the side flaps are folded over and pasted together.

It is true that processes of this known kind permit of the manufacture of different sizes within the same machine, but with restrictions as to dimensions, that is to say, only envelope sizes can be made whose measurements correspond to the entire roller circumference, or to one half, one quarter, etc., thereof, and this only if the rollers are equipped with the number of working tools (gummers, cutting and folding knives) necessary for each case. No intermediate sizes can be made with the same machine.

Working processes of this kind are also restricted to dimensions, however, in that the difference between whichever is the largest and the smallest of the sizes to be made depends on the distance of the individual conveyor roller pairs which in turn finds its limitation in the diameter of the roller.

The known processes, as shown, leave unsatisfied essential needs of the manufacture which calls for universal applicability of one and the same machine. As against this, it is the object of the present invention to achieve universal applicability of one and the same machine within the most extensive limits of the envelope sizes and to make it possible to manufacture, within these limits of adjustability, envelopes of any size.

This is accomplished by replacing, as already described above, the rectilinear conveyance of the blanks, produced by contact with rollers, by an operation in which the conveyance of the blanks takes place by their adherence to the rollers.

According to the process of the invention, the two envelope parts are in the first place cut off from the strip of material or shaped and provided with adhesive substance, then superimposed upon each other and subsequently treated as individual blanks. As in this process the roller distance and thus the roller diameter, on account of the guidance of the blanks by adhesion of the blanks to the rollers, does not enter into consideration, even with the smallest sizes, as a factor for limiting the size of the blanks, and therefore conveyor rollers of any desired size may be selected without restriction of the lowest blank limit, an almost unlimited applicability of one and the same operation or of one and the same machine, with reference to the difference between the smallest and the largest blank size to be made, is obtainable.

According to the process of the invention, the individual blank parts are brought together not, as is done in the known processes, by running in the same direction, but by running in opposite directions. Thereby a special additional or auxiliary adhesion of the bottom between the front and back parts for the purpose of insuring the operation as in the known processes becomes unnecessary. Such an additional or auxiliary adhesion, however, is not precluded in the process according to the invention, but is possible in a still more perfect form, since in connection with it the front and back parts can be pasted together with each other both at the bottom of the envelope and on both sides. This additional or auxiliary adhesion may be provided for or eliminated according to the purpose for which the envelopes are to be used.

An additional characteristic of the process is the use of the novel "hard on hard" stamping-out method by means of knives rotating in the direction of the paper strip and which are built into a roller and roll on a hardened counter-roller. From this arises the possibility of manufacturing, without loss of space, from correspondingly wide rolls of material several blanks alongside of each other in one and the same operation.

The machine for carrying out the process according to the invention is in the main characterized by the fact that the individual parts of the blank detached from the rolls are guided as such, as well as after their union with each other, through the different stages of the operation by means of suction air, in which connection suction air is also made use of in certain places for holding the blank fast during its treatment.

Thanks to this arrangement the machine is adjustable within exceptionally wide limits, that

is to say, on the same machine blanks can be made from the smallest to the largest dimensions, because with this manner of operation the roller distance—which in turn finds its limitation in the roller diameter—does not enter into consideration for the measuring of the smallest blank to be made, as is the case with rotating machines of the known type.

Further characteristics of the machine according to the invention consist of the fact that on the one hand the cutting rollers which detach the paper from the paper strip are provided with segment pieces displaceable in the direction of the roller circumference which, according to the size of the envelopes to be manufactured, can be changed as regards their position on the roller circumference; on the other hand, the cutting roller which makes the corner stampings, is provided with an air line which is placed partly under vacuum and partly under pressure, so that the corner blanks, the so-called "snips," sucked on in the first place by the suction effect can be eliminated from the operation and blown off into a receptacle.

The machine moreover is provided, according to the invention, with an arrangement by means of which the throttling of the individual suction lines is effected in all rollers by a single operation, so that considerable time is saved when changing to different envelope sizes.

With these and other objects in view the invention consists in the improved process and apparatus hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the constructional details of the apparatus may be made without departing from the spirit of the invention or sacrificing any of the advantages thereof.

The drawings show by a diagram and a vertical longitudinal section two examples of execution of machines which work according to the process of the invention:

Fig. 1 shows a machine for the manufacture of envelopes in an operation wherein the envelopes are guided through the machine in the direction of their longer dimension;

Fig. 2 shows one of the suction rollers in the longitudinal section;

Fig. 3 shows the securing of the separating and corner-cutting knives on the roller;

Fig. 4 shows the development of the envelopes in the different stages of the working process, the upper portion of the figure referring to the back parts and the lower portion to the front parts and to the union of the front and back parts. This operation corresponds to Fig. 1.

Fig. 5 shows a machine for an operation in which the envelopes are guided in the direction of their shorter dimension; and

Fig. 6 shows in the different working stages the development of the envelopes in the working operation according to Fig. 5.

In the example according to Fig. 1 the material roll 1 supplies the material for the exactly rectangular or quadrangular back sheet of the envelope. The paper strip is conveyed through the two traction roller pairs 2, 3; 4, 5, between which it is guided in the well-known manner around a sliding tension roller 6. It goes between the cutting roller 7 and its hardened counter-roller 8, which latter is provided with a suction device, so that the paper strip is sucked on at the front edge and, after the cutting off, is brought between the rollers 8, 9 by the roller 8

and is then seized upon the roller 9 by a similar suction device and brought between the rollers 9, 10.

At this point the back sheet unites with the blank, that is to say, with the front part of the envelope. At the same time with the development of the back sheet from the material roll 1 another strip is also run off from a material roll 11 being guided by the traction rollers 12, 13; 14, 15 via the tension guide roll 16. It is brought between the rollers 17 and 18. The roller 18 is a cutting roller which cooperates with a hardened roller 17. It bears the separating knives 19 and the corner cutting knives 20, so that the strip passing through is simultaneously separated into blanks and provided with the corner-cutouts for the flaps.

The cutting roller 18 has an arrangement or device by means of which the snips or scraps cut from the corners are sucked and removed from the operation, in such a way that they are held to the roller until they have arrived vertically below the roller axis. There they are repelled or pushed off into a receptacle 21 by a blowing effect from the suction holes.

The paper proceeding from the roll 11 during the entire cutting operation, that is to say, from the moment when it came into the contact line of the rollers 17, 18, is held by the suction device of the roller 17. The shaped blank detached from the paper strip after the cutting, and now finished, is brought by the roller 17 between the rollers 17, 10, being seized here by suction by the roller 10 and provided in the first place, by a gumming device, with the required adhesive application on its side and bottom flaps. The gumming device consists of a roller 23 applying the adhesive to the shaped blank, this roller taking the adhesive substance from the roller 25 which runs in the adhesive container or receptacle 24.

By the gumming device adhesive substance can be applied both to the side flaps and the bottom flap and also close alongside of the folding lines of these flaps, to the inner surface of the blank (the front part of the blank). The last mentioned application of adhesive serves for the additional or auxiliary pasting of the front part of the blank to the back part and enters into consideration for instance when absolutely dustproof envelopes are to be manufactured.

After the shaped blank is provided with adhesive on its side and bottom flaps, it is still held by the suction roller 10 and is thus fed between the rollers 9 and 10. Here it combines with the back sheet which meanwhile has been fed by the roller 9. After the shaped blank and back sheet are thus united with each other, they reach a member 27 which is guided over a table 26 and consists of an endless band moving over the rolls 28, 29. Over this band runs an endless conveyor chain 33 which is guided over the rolls 31, 32. This conveyor chain 33 is an additional characteristic of the invention. Due to its application instead of conveyor rollers, it is possible, in keeping with the entire object of the invention, to convey even the smallest blanks. The conveyor chain 33 is studded at short intervals with rubber cams which cooperate with the endless conveyor band 27 and thus convey the blank lying in between.

By the conveyor chain 33 and the running band 27 the blank is led through the station for folding over the lateral adhesive flaps. The folding over on the back sheet of the side flaps al-

ready provided with adhesive substance takes place in the well-known manner by loop guides during the conveyance of the blank by the conveyor chain 33. The blank now pasted at the sides reaches the roller 34 which also has a suction device, by means of which the blank is held fast near the folding edge of the bottom flap.

A folding guide 35 bearing closely on the roller 34 raises the exposed bottom flap, in the first place, at an angle to the blank body. As soon as the bottom flap is in this manner bent off from the blank body by a definite amount, the guide 35 lifts off a little from the roller 34, so that the blank still held fast by suction by the roller 34 can slip through between the guide 35 and the circumference of the roller 34 thus folding over the flap already raised. Thereby the bottom flap is caused to bear completely on the back sheet. The guide 35 is controlled by the cam 36 through the medium of the connecting rod 37 and the crank 38 located on the axle of the guide 35. The bottom flap, during the further movement of the blank, is pressed firmly on the back sheet and pasted thereto by the pressing-on roller 39. The now finished blank is laid off on the endless stack belt 42 moving slowly over the rolls 40, 41.

As can be seen on the drawings both in Fig. 1 and in Fig. 5, the tools or suction places are contained in fourfold arrangement on all rollers entering into consideration. The object of this arrangement is that when manufacturing all blank sizes an idling or running without load is avoided as much as possible, that is to say, the small blanks which, measured in the direction of their passage through the machine, are not larger than one quarter of the roller circumference, are made fourfold at each revolution of the roller. As soon as the envelope size exceeds one quarter of the roller circumference, two of the cutting knives are removed and accordingly two each of the suction lines in all suction rollers are put out of commission, in such a way that two diametrically opposite suction lines continue effective. With such an adjustment envelopes can be made up to a size of half the roller circumference. For the manufacture of envelopes which exceed this dimension, a third knife is likewise taken out and a third suction line per roller is rendered ineffective, so that blanks can then be worked up to the size of the full roller circumference. In that case one blank devolves upon each revolution of the roller.

If the blanks, measured in the direction of their passage through the machine, correspond either to the complete circumference of the roller or to exactly one half or one quarter thereof, the paper strip runs off uniformly from the roll. When the blanks are shorter, however, than the entire circumference of the cutting roller or than one half or one quarter thereof, the paper strip runs off intermittently from the roll. In order that in this case the individual sheets may always reach the operation at the proper moment regardless of their dimensions, that is to say, so that they may always be seized at the point where the suction devices and the cutting tools likewise become effective in the proper place, there are fastened on the cutting cylinders 7 or 18 segment pieces 54, 55 which are adjustable in the direction of the circumference of the roller. These segment pieces are adjusted for each blank size to be manufactured in such a way that together with the counter-roller 8 or 17 they seize the end of the paper strip at the moment in which the correct position of the detached blank results on

the conveyor and working rollers. The seizure of the paper strip takes place by the front edge of the segment pieces together with the mentioned counter-rollers.

As already mentioned above, it is necessary, according to the size of the blanks, that is to say, according to whether their extent lies in one quarter, one half, or within the full circumference of the roller, to throttle off two or three suction lines in all rollers. In order to render this throttling possible in as short a period of time as possible, the following arrangement, shown in Fig. 2, is made on each suction roller:

Into the four drill holes of each roller one pipe 56, capable of rotation therein, is inserted. Small gears 57 are firmly connected with these four pipes. The four gears 57 are engaged by a double width gear 61 capable of turning loosely on the roller axle, which gear 61 also engages an idler or intermediate gear 60. This intermediate gear 60 runs loosely on a bolt fastened in the frame jaw and at the same time also engages a double wide gear running loosely on the axle of the nearest adjacent roller, which gear corresponds to the gear 61 described.

The same arrangement exists on all rollers which have a suction device, so that, if any one of the intermediate gears 60 is turned, all the suction pipes 56 in all the suction rollers are turned correspondingly and the suction hole rows 58 of the rollers consequently remain in connection with the suction hole rows of the suction pipes 56 according to the requirements or become disconnected from the same. The suction pipes 56 for that purpose have in their circumference, according to the position in the roller, one or more suction hole rows 59 which can be brought into register with the suction hole rows 58 in the roller itself.

If each of the suction pipes 56 had only one suction hole row which in a certain position would all register with the four suction hole rows 58 of the roller, all four suction hole rows 58 of the rollers would be closed at each turning of the suction pipes 56. Therefore, in those suction pipes 56 which, when turned, are still to remain open by about 90 degrees, additional suction hole rows 59 are provided, so that it is possible, by a proper turning of the suction pipes 56, to close either two diametrically opposite or three suction hole rows 58 of the rollers or to open all four suction hole rows of the rollers.

As has already been set forth at the beginning, it is also possible to manufacture in one and the same machine several envelopes alongside each other. In this connection the paper track running off from the roll is gauged in its width according to the number of envelopes to be manufactured alongside of each other and cut into individual strips while it runs off from the roll. The separation of these strips in the longitudinal direction is effected by the knives 43 and 44.

As against the manufacture of the blank for the front part from a single wide paper roll (in the manufacture of several blanks alongside of each other), the manufacture of the simple rectangular or quadrangular back sheet is effected from individual rolls 1, located alongside of each other and having the width of the envelopes to be made. As shown at Fig. 4, the paper strip running off from the roll 1 is to be separated into individual pieces only in the crosswise direction.

In the example of execution according to Fig. 5, in which the envelopes are guided through the machine in the direction of their shorter dimen-

sion, the operation is the same as described up to the assembling of the front and back parts, and for this part of the operation the same reference numerals as in Fig. 1 have been used.

As soon as the blank in the example of execution of Fig. 5 is assembled between the rollers 9, 10, it is not, as in the example of Fig. 1, released from the suction effect of the roller 10 in order to continue in a straight line, but on the contrary the suction effect of the roller 10 continues as far as the contact line of the rollers 10 and 45. Here the blank is seized with suction effect by the roller 45 and taken along as far as a stationary suction plate 46. After arriving there, the suction effect of the roller 45 ceases and the blank is held by the suction plate 46. Since it was seized, however, in the running line of the rollers 45 and 47 by the roller 47 at the side flap located in the rear in the direction of movement, in the neighborhood of the folding line, this side flap, with the continued movement of the roller 47, is folded over between this roller and the suction plate 46.

The suction effect of the roller 47 continues as far as the contact line of the rollers 47 and 48. Here the roller 48 seizes the blank with suction effect at the second side flap which now lies in the rear in the direction of movement and has not yet been folded over. As the blank is now released during the further movement of the roller 47 and held fast by the stationary suction plate 49, the second side flap during the further movement of the roller 48 is pressed on between the latter and its counter-roller 50.

The envelope, now pasted on both longitudinal sides (the leading and trailing edges), is taken over by a belt guide 51, 51' and conveyed as far as the roller 52. On the way from the rollers 48, 50 to the roller 52 and while between the belts 51, 51', the bottom flap (and—if there is one—also the closure flap) is folded over by a loop guide of the well-known kind and pressed firmly on the back sheet.

By the roller 52 which has a suction effect the envelopes are then laid off in the well-known manner on the slowly moving stack belt 53.

In using any known devices for feeding or drawing in individual sheets, shaped blank stacks can of course be worked according to the same process instead of roll material, the cutting rollers then being eliminated.

Although the drawings and the above specification disclose 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 the details of the process, and in the constructional details of the machine 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 machine for the manufacture of envelopes from sheet material, comprising conveyor rollers each having four lines of suction openings for separately conveying back and front blanks for the envelopes, a suction pipe for each suction line, a bore containing each pipe, and suction control means comprising a toothed wheel connected to each pipe, a common toothed wheel in mesh with all the said wheels on the group of pipes for each conveyor roller, and means for turning all said common wheels simultaneously

for the simultaneous control of the suction devices in all the conveyor rollers.

2. A machine for the manufacture of envelopes from sheet material, comprising means for successively conveying front blanks with flaps thereon and for separately conveying rectangular back blanks, said means comprising rotary members, suction devices on said members for seizing and feeding said blanks individually, an endless band and an endless chain having a row of soft studs cooperating with the band and engaging the blanks for receiving superimposed front and back blanks, means for applying adhesive to the said flaps, and means for closing and pasting the said flaps upon the back blanks.

3. A machine for the manufacture of envelopes from sheet material, comprising means for successively conveying front blanks with flaps thereon and for separately conveying rectangular back blanks, said means comprising rotary members, suction devices on said members for seizing and feeding said blanks individually, cutting rolls for separating the front blanks and removing the corners therefrom, suction means for temporarily retaining the said corners, pressure means for discharging said corners, means for applying adhesive to the said flaps, and means for closing and pasting the said flaps upon the back blanks.

4. A machine for the manufacture of envelopes from sheet material, comprising means for successively conveying front blanks with flaps thereon and for separately conveying rectangular back blanks, said means comprising rotary members, suction devices on said members for seizing and feeding said blanks individually, cutting rollers for the separation of the blanks, cutting knives mounted on said rollers, means for clamping said knives to said rollers after adjustment in a direction circumferentially of the rollers to suit the dimensions of the blanks being handled, means for applying adhesive to the said flaps, and means for closing and pasting the said flaps upon the back blanks.

5. A machine for the manufacture of envelopes, bags and similar articles of various size provided with front parts having lateral, bottom and closure flaps and with rectangular back parts, said machine comprising roller means provided with suction means whereby shaped and detached front parts of substantially equal size and detached rectangular back parts of substantially equal size are engaged on said roller means and are successively conveyed and whereby each back part is brought together with a front part in superposed relation to form an article, the largest sized article formed by said machine having a dimension in the direction of its movement through the machine which is of a magnitude substantially equal to that of the circumference of said roller means, said suction means being adjustable to accommodate the machine for conveying detached parts of equal size having a value for said mentioned dimension which may vary in magnitude between the magnitude of the circumference of said roller means and less than one quarter the magnitude of said circumference, means for turning over the lateral and bottom flaps of the front part onto the back part and for pasting said flaps upon the back part, and means for the delivery of the finished envelope.

6. In a machine for manufacturing envelopes wherein detached back parts and detached front parts, each of the latter having an end flap, are conveyed through the machine by roller means, each front part being brought together with a

back part to form an unfinished envelope, the combination with a rotatable delivery roller for delivering formed envelopes and on which said envelopes are conveyed to a delivery stock, of mechanism for folding said flap for each envelope onto the back part of the envelope, said mechanism comprising oscillating guide means for bending the flap at an angle to the body of the front part and then upon itself and onto its

corresponding back part, a cam rotating on the axis of said roller and driving means actuated by the cam and operatively connected to said guide means for oscillating the guide means during rotation of said roller.

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