

July 16, 1940.

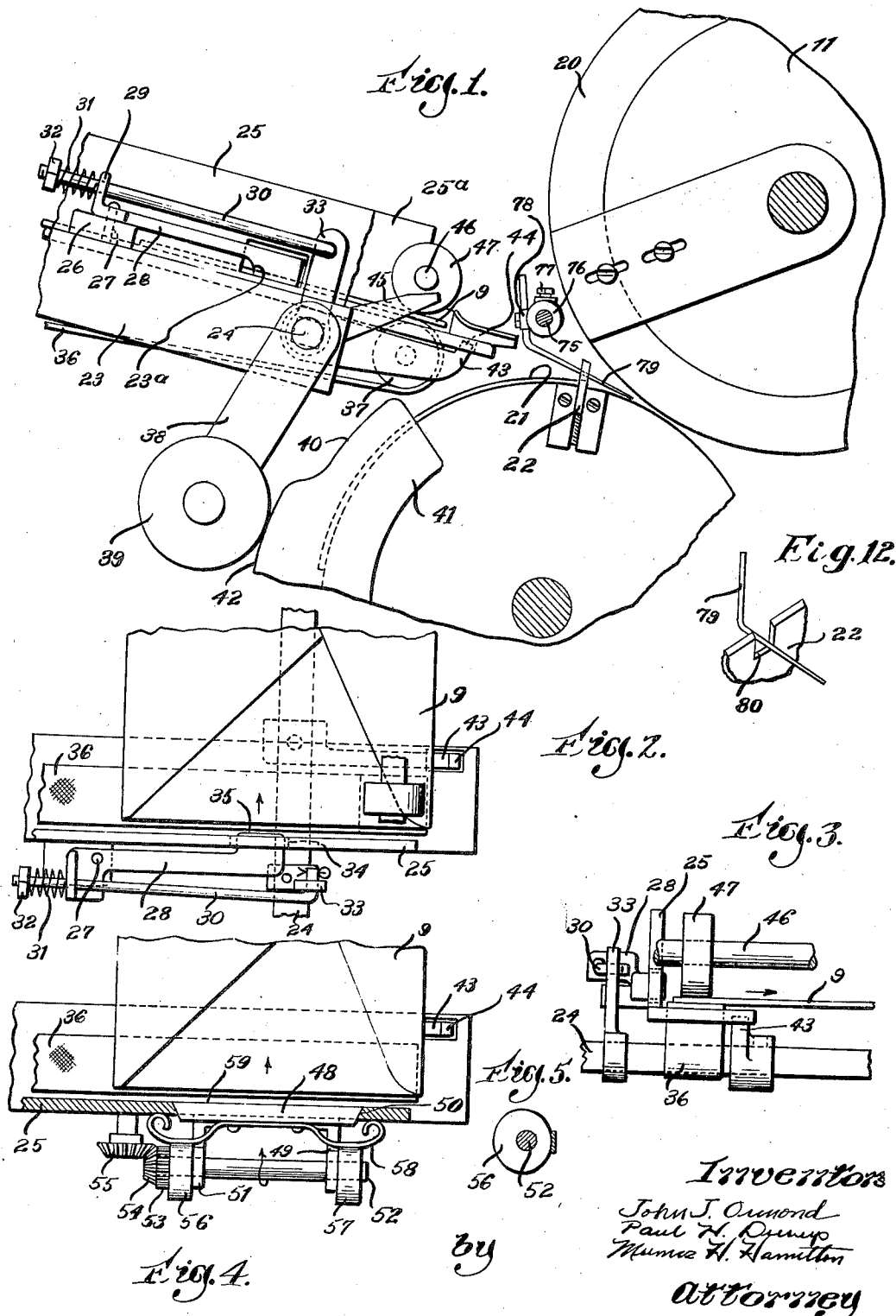
P. H. DURUP ET AL

2,208,045

PROCESS OF PRINTING

Filed Jan. 16, 1939

2 Sheets-Sheet 1



July 16, 1940.

P. H. DURUP ET AL

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PROCESS OF PRINTING

Filed Jan. 16, 1939

2 Sheets-Sheet 2

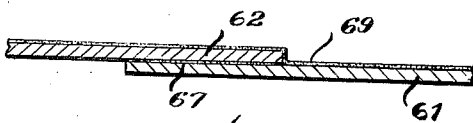
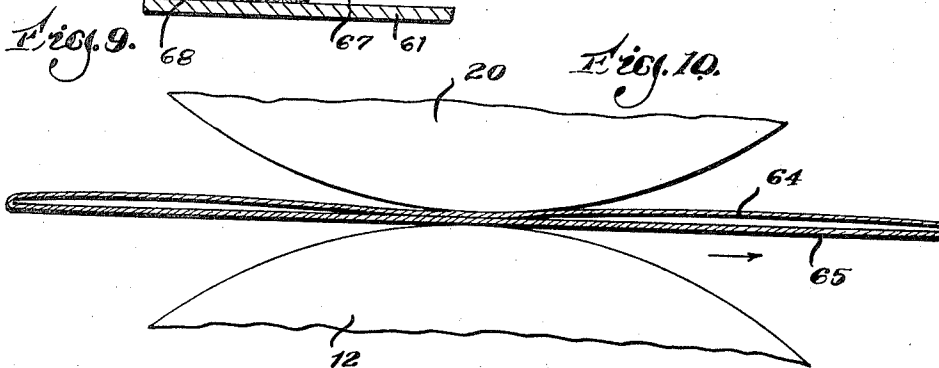
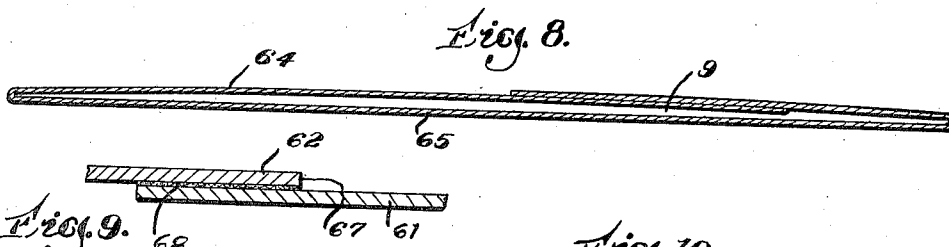
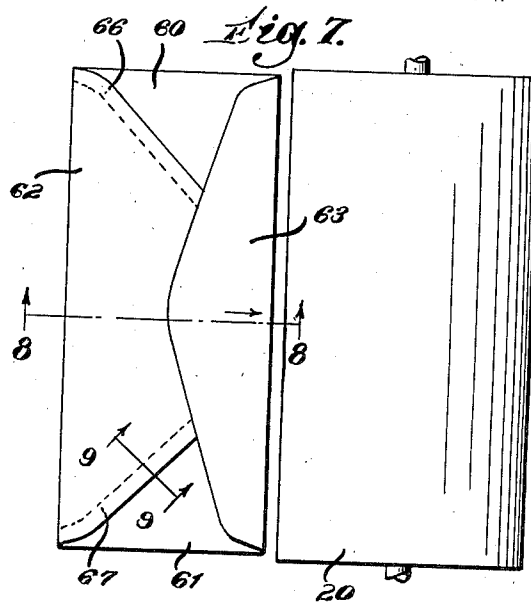
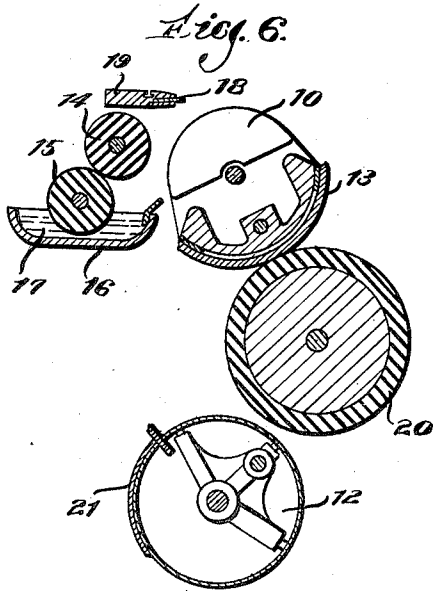


Fig. 11.

by

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UNITED STATES PATENT OFFICE

2,208,045

PROCESS OF PRINTING

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3 Claims. (Cl. 271—52)

This invention relates to a method of printing envelopes, cards, and other sheet subject matter, and to a method of printing envelopes and other separate subject matter from edge to edge.

of the printing members with an envelope shown in cross section engaged therebetween; and

Fig. 11 is a detail view similar to Fig. 9 and further illustrates the detail portion of that figure after the envelope has been printed.

Fig. 12 is a detail view of guide plate construction and holding means.

We provide in our method a procedure for printing sheets of subject matter from edge to edge. This operation differs from common offset practice and is known as "bleeding-off." In any "bleeding-off" operation, it is very difficult to secure proper registration of subject matter advancing to the printing rolls, and to separate such subject matter from the printing blanket, especially in high-speed operation. One method which has been suggested for effecting proper registration, where a gripper mechanism cannot be employed on the surface of the subject matter to be printed, comprises the use of a plurality of conveyor belts moving diagonally relative to a lateral guide plate. This proposal is not satisfactory for effecting fine adjustment at high speeds, particularly when dealing with sheets of subject matter such as envelopes. In the present invention, "bleeding-off" may be effected without gripper or separating mechanism, and without the use of diagonal conveyor belts, and fine register is obtained in high-speed operation. Apparatus suitable for carrying out our method of printing together with a method of printing from edge to edge is now described.

Having particular reference to Figs. 1 and 6, 10 indicates a printing roll, 11 refers to a transfer roll and 12 is an impression roll. Roll 10 may be provided with a printing plate 13 of a gravure or intaglio type and the roll rotates in a clockwise manner as viewed in Fig. 6. This roll picks up ink from a distributing roll 14 deposited thereon by an ink roll 15 in association with an ink trough 16 containing the ink 17. 18 denotes a doctor blade received in bar 19 for removing excess ink from the printing plate 13 during rotation thereof. According to the usual manner of offset printing, ink is pulled from the recessed portions of the intaglio plate 13 on to the resilient blanket 20 of roll 11. The latter roll rotates in conjunction with roll 12 and applies ink to the subject matter 9 to be printed, supported on impression plate 21 of roll 12. In place of the offset printing mechanism illustrated, we may wish to use direct printing machines and similarly other processes of printing as planographic and letter press, may be used with the offset type in place of the intaglio means shown.

5 An object of the invention is an improved method of printing. Another object is a method of printing in register on the back side of an envelope, and a method of printing the back side of an envelope from edge to edge, in the absence of gripping members, at high speeds. Among other objects there may be cited means and procedures, to apply uniformly printed subject matter of high quality upon varying types of envelope and card paper stock; to make use of the mechanical construction of the envelope in effecting an offset printing operation over the back surface of an envelope; to develop high-speed operation by making use of the mechanical construction of the envelope and employing a suitable drying ink therewith; and generally to present an efficient method of printing envelopes having such quality combined with cheapness as to place large scale envelope printing for advertising purposes on an attractively commercial basis.

25 The invention comprises a method of printing in register over a sheet of subject matter at high speed. Apparatus suitable for use in the practice of the invention is illustrated in the accompanying drawings, in which:

30 Figure 1 is a view in side elevation of offset printing members, partly broken away, together with means for registering subject matter with the printing members;

35 Fig. 2 is a fragmentary plan view of the registering means shown in Fig. 1 particularly illustrating side register means.

Fig. 3 is a detail view in end elevation of the mechanism indicated in Fig. 2.

40 Fig. 4 is a fragmentary plan view of a modified side register mechanism.

Fig. 5 is a detail view indicating a symmetrical cross section of a cam member as employed in the modification of Fig. 4.

45 Fig. 6 is a diagrammatic view in cross section illustrating more completely printing means as employed in carrying out my improved process.

Fig. 7 is a plan view illustrating the position in which an envelope is disposed when passing to the printing members.

50 Fig. 8 is a cross section taken on the line 8—8 of Fig. 7.

Fig. 9 is a detail cross section taken on the line 9—9 of Fig. 7.

55 Fig. 10 is a fragmentary view in end elevation

Printing member 20 is adapted to be in rolling contact with pressure roll 21, fragmentarily shown, in which is slidably received a guide plate 22 for receiving the front edge of subject matter to be printed. Adjacent the printing members has been provided a register mechanism which includes a pair of parallelly disposed sides 23 between which is supported a shaft 24. Between sides 23 and passing around shaft 24 are conveyor belts 36, only one of which appears in Fig. 2, driven by rolls 37 and being adapted to advance sheets therealong. Within the sides 23 is a pair of side plates 25 and 25a having horizontally occurring base portions and being laterally adjustable, the nearer one of which, as viewed in Fig. 1, has been broken away.

The side plate 25a and the guide 22 materially assist in effecting register of subject matter passing to the printing members. The guide 22 may be positioned to come into rolling contact with the printing member precisely on the front edge of an ink image on the printing member, and similarly the side 25a may be adjusted to be in register with a lateral edge of the ink image on the printing members, and by these means, together with the conveyor means, a sheet of subject matter may be presented to the printing member in a position suitable for effecting substantially accurate register if the edges of the image on the printing member are not required to coincide exactly with the edges of the sheet of subject matter to effect "bleeding-off."

In the present invention "bleeding-off" may be required and much finer adjustment of these parts and additional register means may be necessary. The sheet 9 must be squarely presented to the printing image, that is, a front edge must be in alignment with the image. Of more importance, however, for a "bleeding-off" operation is maintenance of the sheet in a correct lateral position while being squarely presented; and also maintenance of a correct longitudinal position while being squarely presented and held in a correct lateral position. It is pointed out that a sheet may be squarely presented with an incorrect lateral position or an incorrect longitudinal position and an unsatisfactory result will be obtained. To effect a satisfactory operation, additional register mechanism and the means already referred to have been cooperatively employed in a novel manner to obtain a more positive functioning as now described.

Fixed on shaft 24 and extending beyond the extremities of the sides 25 and 25a is a pair of upturned fingers 43, formed with squared ends 44 which normally occur in the position shown in Fig. 2 above the level of the conveyor belts. Initial front alignment, to present the subject matter 9 squarely to the printing members, is effected against ends 44 by advancing a sheet along belts 36 between the sides 25 and 25a, and on the base portions thereof.

Adjacent side 25 has been secured a block 26, upon which is pivotally secured, by a pin 27, a lever 28, more clearly shown in Fig. 2. The lever 28 is formed with an upstanding end 29 through which is received a rod 30 being resiliently maintained therethrough by spring 31 and nut 32. The other end of rod 30 is engaged in an upstanding stud 33 fixed around shaft 24. Side 25 is formed with a cutout portion 25a through which may be received an inwardly protruding head 35 formed on the forward end of the lever 28.

On the shaft 24, and outside of stud 33, is

fixed a link 38 carrying a cam follower 39. Cam follower 39 normally is engaging with a surface 40 of a cam 41 and when plate roll 12 is passed around into the position shown in Fig. 1, a raised cam side 42 thrusts the cam follower 39 rearwardly, which rotates shaft 24 and advances the position of stud 33 carrying rod 30. As stated, lever 28 is pivoted on pin 27 so that forward movement of the rod results in lateral movement of the lever head 35 through the guide rail 25 which has been adjusted to occur at a point centrally of a sheet passing in front of it. The action of the lever head 35 urges the sheet 9 squarely against the side 25a. This occurs slightly after engagement of the sheet against the fingers 43, and spring 31 then pulls head 35 back into position for a succeeding operation. The subject matter while in its squared position against the finger members is brought into a correct lateral position in register with a lateral edge of an ink image on the printing member toward which the sheet is advancing.

With further rotation of shaft 24 the fingers 43 drop down below the level of the sheet of subject matter and the sheet is free to pass ahead. At this point it will be observed the sheet is in a squared position relative to the rolls and in a laterally aligned position relative to a lateral edge of an ink image on the printing member but no means have been provided for holding the sheet in this position and it must be registered in a correct longitudinal position relative to the ink image.

Fixed on shaft 24 are bars 45 adapted to support and lower a second shaft 46 mounted in the sides 25 and 25a. Shaft 46 is driven by a sprocket gear and chain connected to main driving gears of the machine and carries rollers 47 fixed thereon which are adapted upon lowering of the shaft to have driving engagement with a sheet thereunder on the conveyor belt and the bottom portions of plates 25 and 25a. Lowering of bars 45 takes place when cam follower 39 has been outwardly displaced into the position illustrated in Fig. 1 and is timed to occur while the fingers are dropping so that the sheet is firmly engaged at a rear portion between the rolls 47 and the plates 25 and 25a when the forward edge is disengaged, and the correct lateral position of the sheet which has been effected against the inner side of plate 25a is accurately maintained.

Located transversely in front of the printing members is a shaft 75 supported in an exterior part of the frame of the printing machine. Received on shaft 75 are collars 76 adjustably fixed thereto by means of set screws 77. The collars 77 are formed with lug portions 78 through which are adjustably fixed clip members 79 having bent extremities which are adapted to extend forwardly through recessed edges 80 of guide 22 to a point just in front of the nip of the rolls so that portions of the guide 22 are free to meet the printing member 20 and be depressed thereby and the clip member 79 is maintained in spring contact with the forward edge of the pressure plate 21 while the guide is being depressed and until the edge has nearly reached the nip of the rolls.

The driving rolls 47 immediately advance the sheet to the guide 22 with the peripheral speed of the driving rolls 47 being greater than the peripheral speed of the guide 22 on the roll 21, so that a positive pressure is set up to register the front edge of the sheet in a correct longitudinal-

inal position, and to maintain the sheet in this position while the roll is turning and until the front edge of the sheet 9 has entered the nip of the rolls. It will be noted that the clip 79 will maintain the forward edge of sheet 9 flatly against the plate 21 while the guide 22 is being depressed. If the envelope reaches the front gauge sooner at one side than another, the pressure of the rolls moving at a speed greater than that of the gauge quickly squares the sheet around so that it contacts the gauge along its entire front edge. At the same time, as the gauge is moving it allows the envelope to be squared without any substantial buckling or bending occurring. This not only insured perfect front edge register with the positive pressure referred to, but prevents premature contacting of the printing member with the forward edge of the sheet and eliminates occurrence of blurred or wiped edges. Engagement of the driving rolls continues at the rear end of the sheet after the front edge has entered the printing rolls and this assists in insuring proper maintenance of the sheet in its correct lateral position.

It will be noted that the mechanism described for effecting side register of a sheet to be printed comprises a head 35 which is of relatively small dimension compared with the dimension of a sheet passing therealong, and it is also pointed out that the action of this head 35 is relatively fast, especially in a high-speed operation, substantially approximating a hammer-like stroke. A modified type of mechanism for effecting side alignment has been illustrated in the drawings in Figs. 4 and 5.

As before, the side 25 is cut out at 50 in a beveled manner, and slidably received in the cutout has been provided a modified type of head 48. The head 48 has been sharply elongated to present a greatly increased bearing surface on the edge of a sheet against which it may engage. Head 48 is resiliently maintained in the cutout portion of side 25 by means of a flat spring 58 having opposite extremities bearing on the side 25 and with a central portion of the spring being secured to the head.

A shaft 49 is driven by gears 53, 54, 55 associated with a driving part of the printing machine and mounted on shaft 49 are cams 56 and 57 bearing against spring 58.

The head 48 together with its actuating mechanism is timed to operate with the passage of an envelope or sheet thereby, and it will be noted that in addition to the elongated face providing a greater bearing surface, the action of the cams 56 and 57 tends to effect a gradual travel of the head 48 to whatever degree may be desired and by proper adjustment it is possible to practically urge the sheet against the opposite lateral side and momentarily maintain it there while it is being engaged by the driving rolls 47 above referred to. If desired, other types of heads and other means of gradually contacting such heads with sheets may be resorted to.

The combined effect of the three registering means described is operative on an envelope at three points, a lateral edge, the top side of the envelope and a forward edge, and as a result a treatment particularly suitable for envelopes is carried out, the envelope is maintained in a flat-tensioned state and correct lateral position, transferred in this condition from one register mechanism to another, final longitudinal position effected, and the envelope immediately printed whereby buckling and other difficulties are over-

come in providing suitable register for a "bleeding-off" operation at high speed.

The scope of the printing means illustrated and described is intended to be applicable generally to printing subject matter from edge to edge in the absence of holding means. A particular consideration of this invention, while not to be taken in any limiting sense in regard to the use of the mechanism referred to, is the printing of envelopes, cards, blotters, and the like, and the method of printing will hereinafter be described with reference to an envelope. In printing the entire back side of an envelope, there must be effected accurate register, high-grade printing quality and high-speed operation. An envelope presents particular difficulty due to its size, poor quality of paper and uneven back surface. Moreover, the envelope is relatively light in weight and at high speeds tends to develop troublesome sticking to the printing member. High-speed operation is essential to maintain costs at a practical commercial point and a minimum speed of five thousand envelopes an hour must be maintained for the printing operation to be conducted on a profitable basis.

By using a transfer blanket and a suitable ink for it as shown, it is possible to obtain a high-grade of printing over the uneven envelope surfaces comprising various types of paper stock. The mechanism now described comprises a means for printing in register from edge to edge. When properly utilized with an envelope it may function to carry out high-speed envelope printing at satisfactory rates of speed.

We provide an improved method of printing envelopes with the apparatus described by utilizing certain mechanical features of an envelope which is pertinent to any type of printing on a folded envelope. In considering the mechanical construction of the envelope in relation to the printing apparatus and its ability to overcome sticking on the printing member, it is pointed out that substantially all envelopes are of a size suitable for having a back side printed all over and are of a rectangular or square shape as illustrated in Fig. 2, have their rear sides constructed from two folded over end flaps 60 and 61, have a bottom flap 62 glued down on to the end flaps, and have a top flap 63 left free. It will be observed, as may be better seen in Fig. 3, that an envelope presents two layers of paper 64 and 65, only the top layer 64 of which receives the ink, and it will also be observed that there is a space between the two layers which is constantly maintained, thereby developing a springiness or tendency of the two layers to remain apart even after being pinched together. The reason for this springiness is readily apparent since the folded over parts which make up the back of the envelope tend to open up and occur in a slightly arched state as illustrated in Fig. 3 while the front of the envelope tends to remain in a substantially flat position.

It has been found that this envelope construction, which is common to a majority of envelope types, presents stiffness and multiple-ply character which may be used to advantage, as for example, by opposing and minimizing sticking and thereby allowing higher-speed operation than would be possible with a single sheet.

The tendency of the two plies of paper to spring apart results in distorting of the top ply by the printing member after passing the nip of the printing member while the bottom ply tends to pass along in a straight line and indirectly exerts

a force to carry the top ply with it thereby breaking the top ply away from the printing member.

In addition, the mechanical construction of the envelope is such that it may be more effectively utilized by specific positioning. It is pointed out that an envelope may be advanced to the printing members with either the bottom flap 62 or end flap 60 or 61 or the top flap 63 in a forward position, and will present varying amounts of stiffness in these positions. A maximum amount of stiffness is presented by advancing the top flap of the envelope to the rolls first. The reason for this is that the two edges 66 and 67 secured by gum or glue 68 converge in this position and offer the greatest initial resistance to bending and have the strongest tendency to maintain the envelope in a straight position.

There are further advantages in presenting the top flap of an envelope in a forward position in that it insures the free flaps being completely flattened down when printing occurs and eliminates danger of an unprinted margin developing around the edge of the flap, and it provides an improved method of applying ink against those edges where the bottom flap 62 laps over the end flaps 60 and 61 and results in the ink film 69 tending to effect a sealing action along those edges by rolling the ink thereagainst, thereby preventing accidental loosening of these edges such as often occurs when the envelope is exposed to dampness and other unfavorable conditions.

It will be observed that there is disclosed a method of printing separate sheets of subject matter from edge to edge, a specific application of the method to envelopes together with a method of positioning and advancing an envelope and employing the mechanical construction of the envelope to advantage and associating ink with the edges of the envelope.

There results an efficient and commercially practicable method of printing from edge to edge particularly pertinent to large scale printing of envelopes at speeds as high as ten thousand an hour. The apparatus employed in carrying out the method of printing described is claimed in our co-pending application Ser. No. 251,191, filed January 16, 1939. Changes in the sequence of operations and apparatus shown are intended in accordance with the spirit of the invention as defined by the appended claims.

Having described our invention, we claim:

1. In a method of printing, the steps which comprise aligning the subject matter to be printed both forwardly and laterally, then releasing the subject matter from the aligning means and advancing it positively into contact with forward register means associated with a printing surface, and maintaining the forward edge of the sheet flatly adjacent the forward register means while the latter is being depressed by the printing member.

2. That improvement in methods of feeding subject matter to roll members which consists in advancing said subject matter into contact with depressible register means in one of said rolls, and then maintaining the forward edge of the subject matter flatly adjacent the register as the latter member is depressed.

3. That improvement in methods of registering subject matter to be passed between roll members which consists in positively holding a front edge of the subject matter against a register member in one of the rolls and also flatly adjacent a supporting surface of the register roll until just prior to the point at which the subject matter is engaged by the nip of the rolls.

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