Aug. 19, 1941. V. E. HEYWOOD 2,252,806

MANUFACTURE OF ONE-PIECE, DRY-SEALING WINDOW ENVELOPES

Filed Oct. 10, 1938 2 Sheets-Sheet 1

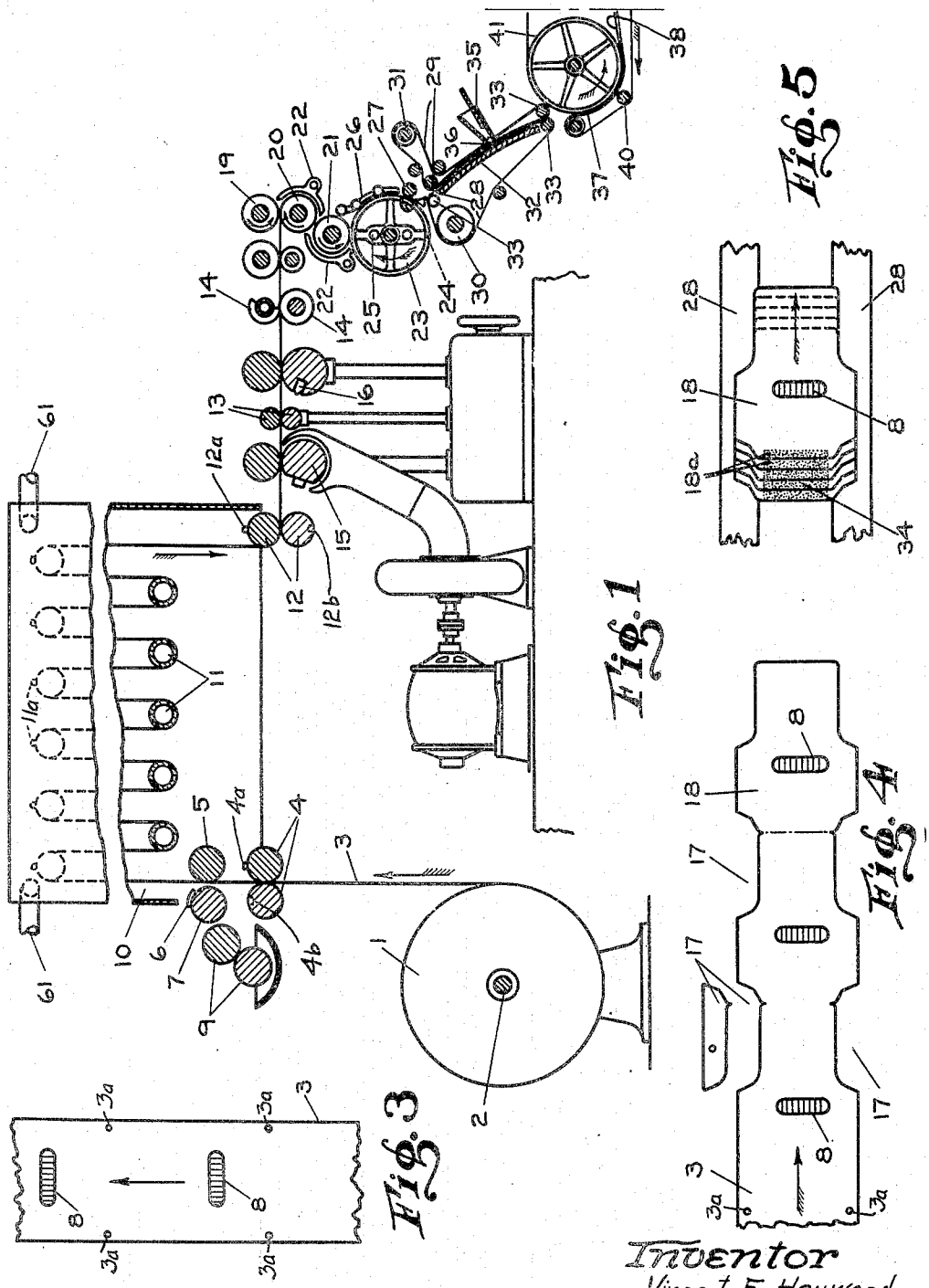


Fig. 1

Fig. 5

Fig. 4

Fig. 3

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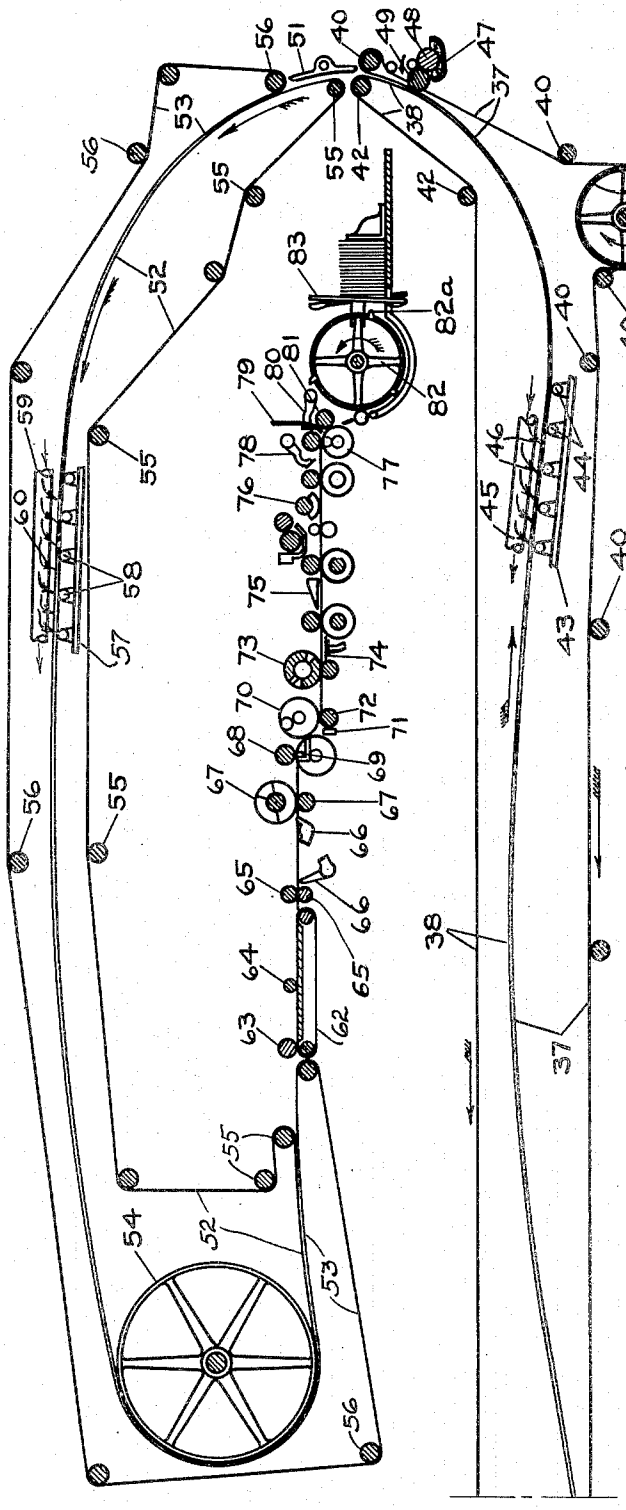


Fig. 2

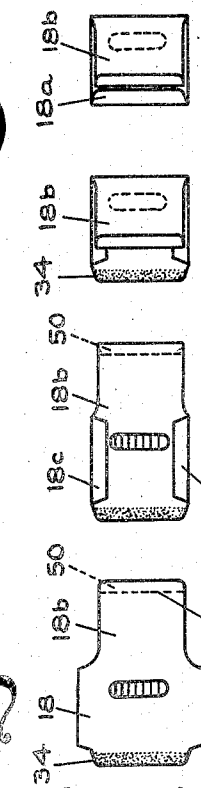


Fig. 10

Fig. 9

Fig. 8

Fig. 7

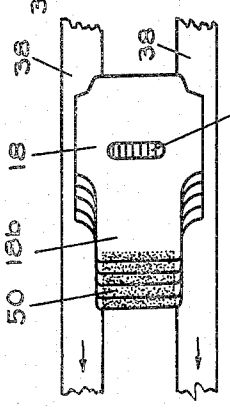


Fig. 6

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MANUFACTURE OF ONE-PIECE, DRY-SEALING WINDOW ENVELOPES

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Application October 10, 1938, Serial No. 234,184

2 Claims. (Cl. 93—61)

The present invention relates to the manufacture of window envelopes of the one-piece type, i. e., those in which an integral portion of the face of the envelope is rendered transparent or semi-transparent, for the disclosure through the transparentized area, of the address on the enclosure within the envelope. The present invention also relates to the manufacture of window envelopes of the dry-sealing type, which envelopes are characterized by the application to corresponding areas of the seal flap and rear wall of the envelope, of adhesive having the property of adhering to itself upon non-moistened contact.

The process of making a one-piece window envelope involves, among other things, the treatment of a portion of the envelope blank, or definite areas of the envelope material, with a suitable penetrating varnish which has the faculty of so reacting on the fibres of the paper, as to partially destroy the opaque character of the same. Such varnish is applied, preferably, to a surface which is disposed inside the completed envelope, so that the outer surface of the envelope is devoid of the stickiness that sometimes characterizes such a varnish, and it is most essential that the transparentizing medium be subjected to a relatively high temperature, to dry it thoroughly and cause the necessary penetration of the paper fibres.

On the other hand, the process of producing a dry-sealing envelope involves the application to correspondingly shaped areas of the envelope material, of a suitable dry-sealing adhesive, which, when in a dry condition, has the property of sticking to itself upon dry contact, while at the same time not adhering to the uncoated envelope material. Such dry-sealing adhesive is usually applied to areas of the envelope material, or blanks, that are disposed outside of the completed envelope, as, for example, on the seal flap and rear wall. Since such dry-sealing adhesives are usually in the form of a dispersed rubber solution, such as a natural or compounded latex, or in the form of a wax compound, provision must be made for drying this adhesive with as little heat as possible, since heat tends to cure or oxidize the adhesive, and destroy its dry-sealing properties.

The manufacture of one-piece, dry-sealing window envelopes, therefore, involves the dual problem of applying the transparentizing medium, followed by the application of a high degree of heat, to promote penetration and drying, and the subsequent application of a dry-sealing adhesive medium, which must be dried with as little heat as possible, to insure complete retention of the dry-sealing qualities of the adhesive.

According to the present invention, the problems involved in the application of a transparentizing medium and a dry-sealing adhesive to different and separated areas of material for the manufacture of one-piece envelopes, are successfully solved, by making the entire process continuous, the successive operations involving the application and drying, with different degrees of heat, of the transparentizing and dry-sealing mediums being accomplished automatically, at separated stations, by a series of related steps. The particular mode or manner in which such continuous manufacture of envelopes is obtained, as well as other advantageous features of the invention, will be fully set forth in the following description, with reference to the accompanying drawings, in which:

Fig. 1 is a view in side elevation of a portion of the apparatus for carrying out the invention.

Fig. 2 is a view in side elevation of the remainder of the apparatus, Figs. 1 and 2 being adapted to show the apparatus, as a whole, when placed end to end.

Figs. 3 to 10, inclusive, show the working stages, or operations, performed on the envelope material, in the production of one-piece window envelopes provided with dry-sealing adhesive areas.

Like reference characters refer to like parts in the different figures.

Referring first to Fig. 1, a supply of envelope material is shown in the form of a roll 1 of paper, rotatably mounted on trunnions 2, with the paper passing upwardly as a continuous web 3 between a pair of rotatably driven feed rolls 4. The rolls 4 provide cooperating pairs of punches 4*a* and recesses 4*b* which are so located as to make holes 3*a* at regular intervals along the edges of the web 3 for indexing purposes, as will later appear. Beyond the rolls 4, the web 3 passes in tangential relation to a cylinder 5, which acts as a bed plate for a die 6 on a varnish imprinting cylinder 7. The die 6 is of a size and shape suitable for imprinting an oval or rectangular window, or transparency, on the web 3 at regular intervals, as shown at 8 in Fig. 3. The operation of the rolls 4 and cylinders 5 and 7, is so timed that the die 6, which receives at each revolution a supply of varnish from rolls 9, is brought into contact with the web 3 on the cylinder 5, at regularly spaced intervals. The exact distance between successive indexing holes 3*a* and windows 8 on the web 3 is determined by the length of the envelope blanks that are substantially cut from the web 3, as will later appear.

After being operated upon by the die 6, the web 3, with the spaced windows 8 of transparentizing varnish thereon, passes into a suitable oven 10, within which the web passes back and forth several times around rolls 11 providing indexing pins 11*a* for the holes 3*a*. While in the oven 10, the web is subjected to a high degree of heat,

which results in complete penetration of the paper fibres by the varnish, and the evaporation of excess moisture in the varnish. Therefore, when the web 1 emerges from the oven 10 between feed rolls 12, its transparentized windows 8 are substantially dry.

From the rolls 12, which provide indexing pins 12a and recesses 12b, the web 3, with the windows 8, continues in a horizontal plane between additional pairs of rolls 13—13 and 14—14, which serve to support the web as it is successively operated upon by side cutters 15 and cross cutters 16. As best shown in Fig. 4, the side cutters 15 serve to form notches 17 at regular intervals along opposite sides of the web 3, where the indexing holes 3a were previously located, while the cross cutters 16 serve to sever the web at intervals between the sides of the notches 17, to form envelope blanks 18. The upper roll 14 is segmental in form, so that it is adapted to deliver the blanks 18, one by one, to a suitable mechanism for applying dry-sealing adhesive to portions of each blank that will constitute the seal flap and the rear wall of an envelope formed from the blank by suitable folding and gumming instrumentalities.

As previously pointed out, the invention also contemplates the drying of the adhesive, following its application to the envelope material, with as little heat as possible, so that the dry-sealing properties of the adhesive will not be adversely affected. For the purpose of applying the adhesive and drying the same, any suitable mechanism may be employed, and there is shown in Figs. 1 and 2, as an illustrative embodiment of the present invention, a mechanism operating in substantially the same manner as the adhesive-applying and drying mechanism shown and described in Winkler and Dunnebier Patent No. 2,019,946, issued November 5, 1935.

The rolls 14 convey the blanks 18 with their windows 8 uppermost, to a series of cylinders 19, 20 and 21 and cooperating guides 22, which deliver each blank separately to the periphery of a pair of spaced suction disks 23. The disks 23 provide diagrammatically opposed suction openings 24 extending from suction passages 25, and suitable pneumatic suction control devices, not shown, cause the disks to engage each blank with the openings 24, and conduct it under guides 26 to a pair of rolls 27. The rolls 27 are driven so slowly with respect to the delivery speed of the blanks by the suction disks 23, that the blanks become arranged in stepped relation one above and behind another, as they enter between pairs of conveyor belts 28 and 29. The stepped arrangement of the blanks 18 is shown in plan on an enlarged scale, in Fig. 5, the speed of the stepping rolls 27 being so controlled that the spacing of the edges of the blanks corresponds exactly to the desired width of the coating of dry-sealing adhesive to be applied to each closure flap 18a of a blank 18.

In this stepped condition, indicated in Fig. 5, the blanks 18 move between the pairs of conveyor belts 28 and 29, which are driven in unison from drums 30 and 31, respectively, and are supported at the ends of a curved table 32 by guide rolls 33. While passing between the conveyor belts 28 and 29 and supported by the table 32, the stepped blanks 18 receive a coating 34 of dry-sealing adhesive on their exposed flaps 18a, from an adhesive applying container 35. The container 35 is closed on four sides, but provides a narrow feeding slit 36, which bears closely on the stepped edges of the blanks so as to apply the adhesive to the flaps 18a, as the stepped pile of blanks is moved by the belts 28 and 29 beneath the container 35. The adhesive in the container 35 is of dry-sealing character, and may be of any desired composition, applicable in liquid form, but which, when in a dry condition, will have the property of sticking to itself upon dry contact, while at the same time not adhering to the uncoated material of the blanks 18.

As the stepped blanks 18 run out from between the rolls 33 at the ends of the belts 28 and 29, with the adhesive 34 applied thereto, they enter between additional pairs of conveyor belts 37 and 38, extending to the other end of the machine. A drum 39 serves to drive the lower belts 37 in cooperation with a series of guide rolls 40, while a drum 41 similarly drives the upper belts 38 in cooperation with guide rolls 42. The arrangement of the drums 39 and 41, and of the two series of guide rolls 40 and 42, is such that the belts 37 and 38 are opposed to each other for substantially one-half of their total lengths, where they extend over an arched frame 43, carrying a series of guide rolls 44. For the purpose of simplifying the drawing, only a small portion of the frame 43 is shown, and there is provided above the frame an air duct 45, which provides openings 46 in the wall facing toward the belts. Dry and somewhat heated air drawn from any suitable source through the duct 45 is blown onto the coating of adhesive 34 on the pile of blanks 18, as they are conveyed from one end of the machine to the other by the belts 37 and 38, the moisture content and temperature of the air within the duct 45 being so controlled that it will properly accelerate drying of the adhesive 34, without affecting its dry-sealing properties. Since the belts 37 and 38 are driven somewhat faster than the belts 28 and 29, the original stepped spacing of the blanks shown in Fig. 5 is slightly increased when they are transferred to the belts 37 and 38, thereby preventing the adhesive coated flaps 18a from sticking together at their edges as the adhesive 34 dries.

As the blanks 18 are directed upwardly at the right-hand end of the machine by the belts 37 and 38, the stepped edges of the rear wall flaps 18b are acted upon by a second adhesive applying device, located between the belts 37. This device consists of a container 47 for dry-sealing adhesive, in which operates a dipper roll 48, serving to transfer dry-sealing adhesive to the applying roll 49. As indicated by the arrow, the applying roll 49 has a direction of rotation such that the side thereof disposed towards the belts, moves opposite to the direction of movement of the pile of blanks 18. Consequently, the overlapped edges of the flaps 18b are provided with a coating 50 of dry-sealing adhesive, as indicated in Fig. 6.

As the pile of blanks 18 emerges from between the belts 37 and 38, they are provided on both sides with coatings of adhesive 34 and 50, with the adhesive 34 in dry condition, due to the previous passage of the blanks beneath the air duct 45. The blanks next pass beneath a guide 51 and enter between spaced pairs of conveyor belts 52 and 53, which extend rearwardly over the top of the machine, and serve to convey the blanks to the blank folding and gumming mechanism. Both pairs of belts 52 and 53 pass around the drums 54, and are independently supported by sets of guide rolls 55 and 56, respectively. Between the drums 54 and the guide 51, opposed

portions of the belts 52 and 53 are guided over an arched frame 57 carrying a series of rolls 58, similar to the frame 43 and rolls 44, previously mentioned. Only a portion of the frame 57 is shown, and there is provided above the frame an air duct 59, providing openings 60 facing toward the belts. Dry and somewhat heated air, drawn from any suitable source through the duct 59, is blown onto the moist adhesive 50, as the pile of blanks is conveyed from one end of the machine to the other by the belts 52 and 53, the moisture content and temperature of the air within the duct 59 being so controlled as to accelerate drying of the adhesive 50. Since the belts 52 and 53 are driven somewhat faster than the belts 37 and 38, the stepped spacing of the blanks 18 is slightly increased, thereby preventing the adhesive coated flaps 18b from sticking together at their edges as the adhesive 50 dries.

As the pile of stepped blanks 18 is carried through the machine, first between the belts 37 and 38, and then between the belts 52 and 53, it is apparent that not only will the dry-sealing adhesive 34 and 50 be thoroughly dried, but that the applications of transparentizing varnish to form the windows 8, will also be further cured, so as to substantially eliminate any tackiness. It has also been found that the passage of the envelope material through the oven 10, where a high temperature is maintained, insures the delivery of the blanks 18 to the first adhesive-applying station, in a pre-heated and thoroughly dry condition. Consequently, the drying of the adhesive 34, as well as the adhesive 50, is accelerated, since the envelope material really never loses the residual heat carried along as a result of passage of the material through the oven 10 at a temperature sufficiently high to cause penetration of the paper fibres by the transparentizing varnish. The close proximity of the oven 10 to the air ducts 45 and 59 also results in a saving of heat, since it makes possible the heating and drying of the air supplied to the ducts 45 and 59, through passage of this air through the oven in suitable conduits 61, as indicated in Fig. 1.

The stepped blanks, with the windows 8 and the adhesive areas 34 and 50 completely dried, as indicated above, run out from between the belts 52 and 53 onto horizontally disposed belts 62 cooperating with top rolls 63 and 64. The blanks then pass between a pair of rolls 65 which, being driven faster than the belts 62, serve to completely withdraw the blank which, at the moment of entering between the rolls 65, is foremost in the pile. Each individual blank is then straightened and registered by fingers 66, cooperating with rolls 67, before passing between a pair of rolls 68, one of which provides a creasing knife 69. The knife 69, in conjunction with a groove provided in the upper roll 68, produces a preparatory crease 50a in the blank directly behind the adhesive area 50 along the margin of the wall flap 18b, as shown in Fig. 7. The blank is next acted upon by a suction roll 70, which engages the blank behind the crease, and in cooperation with a folder rail 71 and roll 72, brings about folding down of the flap beyond the crease, so that the adhesive 50 is covered, as indicated in dotted lines in Fig. 7.

The blank 18 then passes between creasing rolls 73, from which it receives preliminary creases for the bottom and closure flap folds, after which the side flaps 18c are turned up and folded over by the folders 74 and 75, as shown in Fig. 8. The folded over flaps 18c are then acted upon by the gumming rolls 76, after which the bottom flap 18b is bent up and projected between rolls 77 by a knife 78, which causes the flap 18b to be adhered to the previously gummed side flaps 18c, as shown in Fig. 9.

The envelope thus formed runs out from between the rolls 77 onto a guide plate 79, while the closure flap 18a is suction-held by the lower roll 77, after which a knife 80 projects the envelope in the reverse direction between a roll 81 and the lower roll 77, so that the closure flap 18a is folded down to cover the adhesive 34, the completed envelope then appearing as shown in Fig. 10. The conveyor disks 82, provided with lugs 82a, then feed the finished envelopes, one by one, to a stacking device 83.

From the foregoing, it is apparent that by the present invention there is provided an improved method of making one-piece, dry sealing window envelopes, in a continuous manner, whereby the successive operations involving the application and drying, with different degrees of heat, of the transparentizing and dry-sealing mediums, are accomplished automatically at separated stations, by a series of related steps. In the following claims, it is to be understood that the term "envelope material" means any material, available in either web or blank form, that may be converted into envelopes after the application and drying of the transparentizing and dry-sealing mediums.

I claim:

1. The herein described method of making one-piece, dry-sealing window envelopes in a continuous manner, which consists in first applying, at a given station, a liquid transparentizing medium to different window areas of unperforated envelope material, then drying said areas while subjecting said material to a high degree of heat, then applying, at a station separated from said first station, a liquid dry-sealing adhesive medium to areas of said material different from said window areas, followed by the further drying of both said window and adhesive areas with an application of heat materially less than the heat accompanying the first drying, with said stations being close enough together to insure the delivery of the material to the adhesive applying station in a preheated and dry condition.

2. The herein described method of making one-piece, dry-sealing window envelopes in a continuous manner, which consists in first applying, at a given station, a transparentizing varnish to separate window areas of unperforated envelope material, subjecting said areas to a high degree of heat sufficient to cause penetration of the material by said varnish, next applying, at a station separated from said first station, a liquid dry-sealing adhesive to areas of said material separate from said window areas, and finally in subjecting said adhesive areas to a drying action with a low degree of heat insufficient to adversely affect the dry-sealing properties of said adhesive, accompanied by further drying of said window areas, with said stations being close enough together to cause said material to retain residual heat in its passage between said stations.

VINCENT E. HEYWOOD.