June 28, 1949. W. G. BORCHERS 2,474,775

METHOD AND APPARATUS FOR SIMULTANEOUSLY SECURING TOGETHER AND PERFORATING PAPER WEBS

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Fig. 1

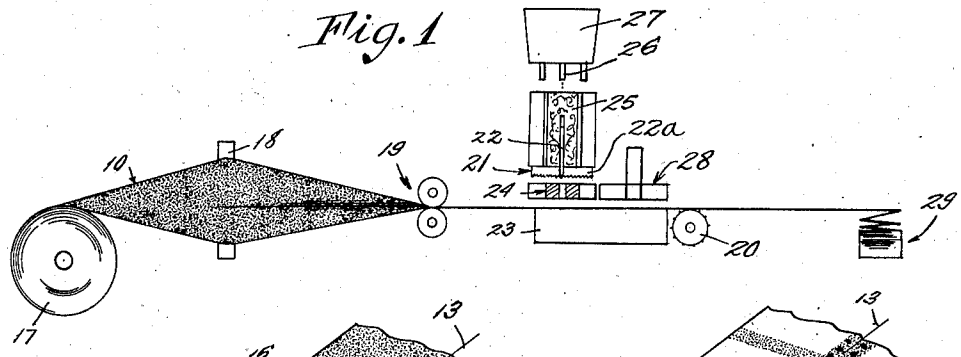

Fig. 2

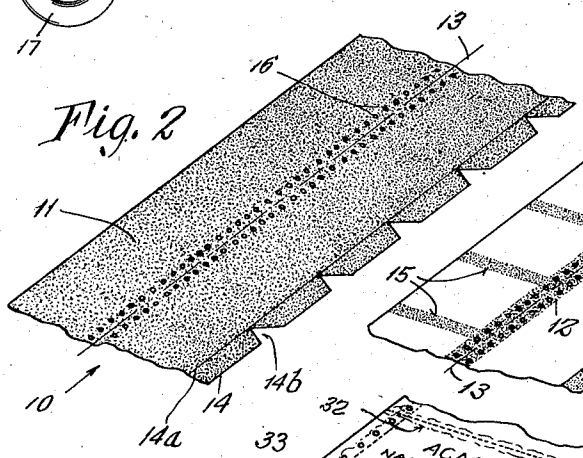

Fig. 3

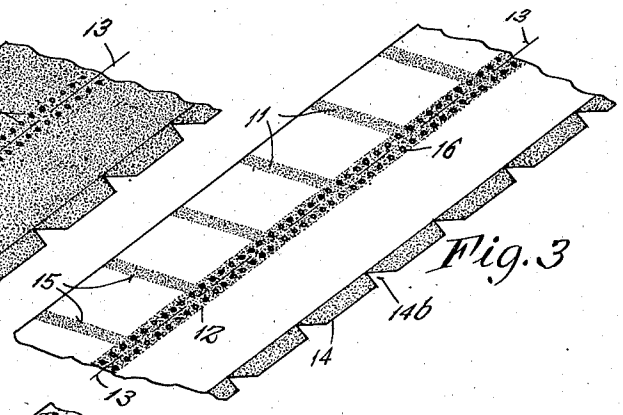

Fig. 4

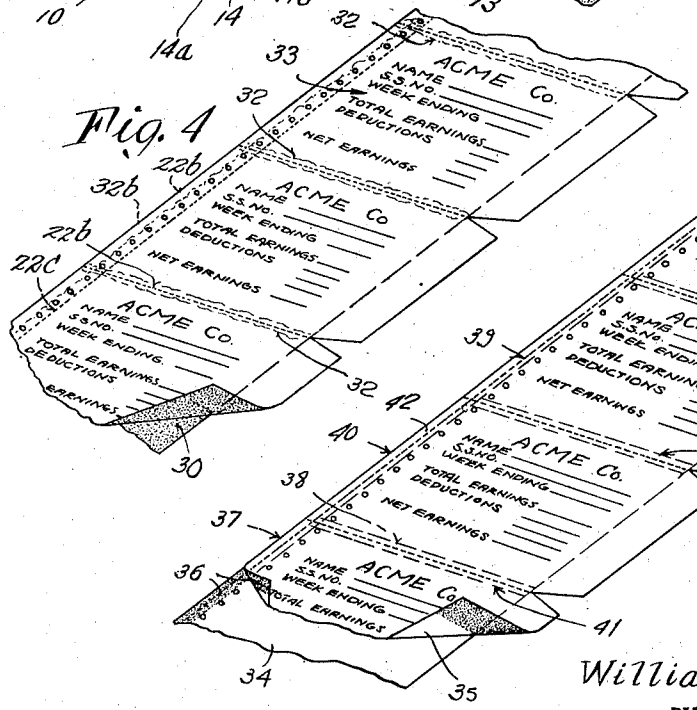

Fig. 5

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METHOD AND APPARATUS FOR SIMULTANEOUSLY SECURING TOGETHER AND PERFORATING PAPER WEBS

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15 Claims. (Cl. 93—61)

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This invention relates to a novel method for securing together superposed plies of stationery with adhesive, over desired areas, and particularly to the manufacture of continuous form envelopes.

It has been proposed heretofore to make continuous form envelopes by folding a web of stationery longitudinally upon itself, and securing the superposed plies of the web together with an adhesive along transverse stripes at form width intervals. The resulting strip of series-connected envelope pockets can be severed through the transverse stripes of adhesive, or transverse weakened severance lines can be formed therein so that the stripe can be readily severed into individual envelopes after processing in continuous form, as for example by printing or otherwise inscribing desired data on successive envelopes.

A known procedure for securing together the superposed plies of a longitudinally folded web along transverse stripes to form a series of envelopes comprises progressive application of an active adhesive to the desired areas prior to folding the web, carrying out the folding operation, and pressing the plies together while the adhesive is in active condition. However, application of an adhesive to the web in this manner requires special machinery, and is relatively inconvenient and expensive.

A more satisfactory procedure involves application of an inactive adhesive to the web over the desired areas, so that the web can be stored until it is used. Such a web can be longitudinally folded, and the adhesive activated to cause the plies of the web to adhere together at the desired areas, such as transverse stripes. Thermoplastic adhesives are suited for this purpose, and can be activated after the web is folded by heating. However, as compared with ordinary adhesives such as glue or various gums which are activated by liquids, thermoplastic adhesives are relatively expensive. While adhesive activated by liquids can be applied to the unfolded web, and the latter stored or folded while the adhesive is in inactive state, no satisfactory and economical method for activating the adhesive to secure the superposed plies of the web together to form a continuous envelope strip has been proposed heretofore.

It is an object of my invention to provide a simple and economical procedure for making a strip of continuous form envelopes from continuous superposed plies of stationery and preferably from a longitudinally folded web, having

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on the contiguous inner surfaces of the plies an inactive adhesive, susceptible to activation by an activating liquid, extending over the areas to be secured together.

In the broader aspects of my invention, it is an object to provide a simple method for securing together a pair of plies of stationery having on the surface of at least one of said plies, facing the other ply an area of inactive adhesive of the aforesaid type.

It is also an object of my invention to provide a method to form weakened severance lines in a pair of superposed plies of stationery having an inactive adhesive as aforesaid on adjacent contiguous areas of said plies, and for simultaneously securing said plies together adjacent said weakened severance lines.

A further object of my invention is to provide simple and efficient apparatus for carrying out the foregoing processes in an efficient and economical manner.

In a preferred embodiment of my invention, a continuous envelope strip is formed from a continuous web of stationery, folded longitudinally upon itself, and having on its inwardly folded surface an inactive adhesive of the type susceptible to activation by treatment with an activating liquid, said adhesive covering areas on at least one of the plies of the web including transverse stripes at form length intervals along which it is desired to secure the webs together. The adhesive may be applied to only one of the plies of the web but is preferably extended over contiguous areas of both plies to effect a more perfect bond. The adhesive can be applied solely to the areas to be adhered together or, if desired, to wider areas, up to the entire inwardly folded surfaces of the web. The superposed plies of the folded web are perforated through the adhesive areas with a perforating instrument such as a perforating rule or roller, so as to form weakened severance lines, particularly transverse severance lines, at form length intervals. An activating liquid for the adhesive is introduced between the plies through the perforations, in sufficient amount to penetrate a short distance adjacent said perforations so as to activate the adhesive, and form a bond between the plies when the latter are pressed together.

In accordance with the preferred process of my invention, introduction of the activating liquid is accomplished simultaneously with the perforating operation by moistening the perforating member or instrument with said liquid just before, or while, it pierces the superposed

plies of the web. The adhesively superposed plies are then preferably pressed together to insure formation of a bond between the plies by the activated adhesive.

The apparatus required for carrying out the process of my invention comprises a conventional perforating device such as a perforating rule or roller and a moistening device such as a wick which contacts the perforating rule or other instrument as it enters the superposed plies of stationery. Advantageously, a presser device is provided for holding the webs together at the point where the perforation is effected or after the webs pass beyond the perforating station.

It will be noted that the equipment required is of the utmost simplicity and can be readily constructed by a simple modification of an apparatus for perforating webs. The small amount of liquid adhering to the perforating member as a result of contact with the moistening device is sufficient to spread between the superposed plies of the stationery, particularly as a result of capillary attraction, so as to activate the adhesive solely over an area adjacent the perforations. Thus, in an envelope strip manufactured in accordance with my invention the successive envelopes are joined together at transverse weakened severance lines and have their plies adhesively secured together in face-to-face relation adjacent the said severance lines. If need be, the amount of liquid transferred from the moistening device to the perforating member can be regulated by applying a repellent film, for example, a film of oil if the activating liquid is water, to the perforating instrument, so that lesser amounts of the liquid will be carried to the webs.

My invention will be more fully understood from the following description of a preferred embodiment thereof, taken in connection with the accompanying drawings, wherein

Figure 1 is a diagrammatic view of an apparatus for carrying out the process of my invention.

Fig. 2 is a perspective view of a strip of stationery suitable for use in accordance with my invention.

Fig. 3 is a modification of the strip shown in Fig. 2.

Fig. 4 is a perspective view of a continuous envelope strip made in accordance with my invention.

Fig. 5 is a modified form of the envelope strip.

Referring to the drawings, a continuous web of stationary 10, shown in Fig. 2, is provided with a coating on one surface thereof of inactive adhesive 11 susceptible to activation by treatment with a liquid. The web 10 is folded longitudinally upon itself along a fold line 13. The latter may be centrally located in the strip so that both plies of the resulting folded web are of equal width, but advantageously one of the plies extends beyond the other so as to leave a projecting margin 14 connected to the strip at a fold line 14a and preferably provided with notches 14b at form length intervals to form flaps for the series of envelopes to be made from the web. The margin 14 is likewise coated with the adhesive 11, as shown, for closing the envelope flaps. Instead of applying the adhesive 11 as a continuous coating to one side of the strip 10, it may be applied in transverse stripes 15 at form length intervals extending transversely on at least one side of the fold line 13a as shown in Fig. 3, the adhesive 11 also being applied to the flap-forming margin 14. For additional reinforcement, if desired, the adhesive 11 can also be applied along a longitudinal stripe 12 running along the fold line 13. The arrangement of Fig. 3 is preferable to that of Fig. 2 for reasons of economy in use of adhesive, and to avoid the possibility that the coating might be accidentally activated to cause the plies of the web to stick together at undesired points.

The adhesive 11 may be of any type susceptible to activation upon treatment with a liquid, preferably a volatile liquid. Adhesives which can be activated with water such as ordinary animal glue, or gums prepared from starch or other vegetable sources such as dextrin, are preferably used by reason of their relatively low cost. However, other adhesives which can be activated by organic solvents, such as natural or synthetic resins, cellulose esters and ethers, and the like can be used if desired.

The strips shown in Figs. 2 and 3 are advantageously provided with pin feed apertures 16, arranged in symmetrical longitudinal series on opposite sides of fold line 13 so as to coincide when the web is folded upon itself along line 13, said apertures facilitating advancement of the web by increments of a form length interval.

In carrying out the process of my invention, a continuous web of stationery carrying an inactive adhesive as shown in Fig. 2 or 3, is folded longitudinally along line 13 bring the two plies thereof into face-to-face relation, the adhesive coating 11, or stripes 12 and 15 being on the inwardly folded or contiguous surfaces of the plies. For example, as shown in Fig. 1, the web 10 can be withdrawn from a roll 17 across a guide bar 18, and progressively folded longitudinally along fold line 13 at a folding station 19. Advancement of the web can be effected or controlled by engagement of a pin feed device 20 with the apertures 16 in the folded web.

The web is intermittently advanced by form length intervals to bring stripes 15 or notches 14b into registry with a transverse and longitudinal perforating device 21 which comprises perforating rules 22 and 22a, and a table 23 on which the folded web 10 is supported. The perforating rules 22, 22a are operated preferably automatically to engage the web at form length intervals each time the web comes to rest after advancement and pierces the superposed plies thereof with lines of perforations forming weakened severance lines 22b and 22c as shown in Fig. 4. In order to hold the web during the perforating operation, a stripper 24 descends to clamp the web 10 against table 23 during each operation of the perforating device 21. The stripper 24 and perforating device 21 are then retracted during further advancement of the web.

On one or both sides of the perforating rules 22, 22a, the perforating device 21 comprises a wick 25 of felt or other absorbent material, which contacts that portion of the perforating rules which perforates the superposed plies of web 10, as the rules descend to engage the web 10. The wick 25 is moistened with an activating liquid for the adhesive 11, for example water, by a drip device 26 supplied from a reservoir 27. The perforating rules 22, 22a, contact the wick 25 during the perforating operation and is thereby moistened with a small amount of the activating liquid which adheres to its blades. As it penetrates the superposed plies of the web 10, the liquid carried by the blades is introduced between the plies of the web spreading a short distance around the lines of perforations 22b, 22c, particularly by reason of the capillary attraction

of the superposed surfaces of the stationery. The small amount of liquid thus introduced spreads a short distance on either side of the line of perforations 22b, 22c to activate the adhesive 11 or stripes 15 over a limited area adjacent the perforations.

The bond between the superposed plies of web 10 is completed preferably by a pressing device 28 which engages the web a form length beyond the perforating rule after the web is perforated. Instead of a presser foot, as shown, other pressing devices such as a pair of pressure rollers can be used. The activated adhesive is allowed to set by evaporation of the activating liquid, and the resulting continuous form envelope strip can be formed into a zigzag folded pack 29.

When water is employed as the activating liquid, transfer of excessive amounts thereof by the perforating rule or other member can be controlled by providing a light film of oil on said member, the amount of oil determining the amount of water transferred from the moistening device to the stationery.

The resulting envelope strip, shown in Fig. 4, comprises a series of pockets 30 interconnected at the perforated and thus weakened transverse severance lines 22a and comprising two plies secured together along the areas 32 adjacent the lines 23 of perforations. The fold line 13 of the original web constitutes the bottom of each of the envelope pockets. The resulting continuous envelope strip can be handled in a typewriter or printing press for inscription of desired data on the respective envelope forms, and the latter can then be severed along the lines of perforation 22a into individual envelopes. The flaps 14 can be folded over and secured by the coating of adhesive 11, carried thereby, to the surface of the envelope after its contents is inserted.

If desired, the series of pin-feed apertures 16 are advantageously used, when formed in the original strip, to control the advancement thereof so as to bring the transverse severance lines or stripes 15 at form length intervals into registry with the perforating device 21. The pin-feed apertures 16 can also be used to advantage for feeding the continuous envelope strip during subsequent inscription thereof. Printed form matter 33 can be applied by conventional printing methods to each form of the web 10 before or after it is folded and before or after the perforating and bonding operation.

If it is desired to provide additional reinforcement of the envelopes adjacent the bottoms thereof, formed by fold line 13, the strip of envelopes can be perforated longitudinally by a perforating device, moistened with activating liquid for the adhesive 11, adjacent the fold line 13 in the strip of Fig. 2, or within the limits of the longitudinal stripe of adhesive 12, in the strip of Fig. 3, and pressing the plies of the strip together adjacent such line of perforations to form an adhesive bond between the plies at this point. Such a line of perforations 22b and the resulting bonded area 32b is indicated in Fig. 4.

The perforating, moistening and pressing devices for providing such reinforcement can be the same as those shown in Fig. 1, except that they operate longitudinally instead of transversely of the strip.

Modifications can be made in the invention without departing from the scope thereof, as will be obvious to those skilled in the art. Thus, the invention in its broader aspects provides a process for securing together any two superposed plies of

stationery carrying an inactive adhesive susceptible to activation by liquid on their contiguous surfaces, whether the plies are connected or not at a fold line. Thus, such plies can be secured together adjacent any line of perforations, whether transverse or disposed in any other direction. For example, a continuous envelope strip can be formed, from two separate superposed webs 34 and 35 of stationery, as shown in Fig. 5, by providing an inactive adhesive 36 along a margin 37 thereof, as well as along transverse stripes 38 at form length intervals; or, if desired, the adhesive can cover the entire contiguous surface of one or both of said webs. The superposed webs of stationery are perforated along a line 39 adjacent the margin 37 as well as along the transverse lines, stripes 38, at form length intervals, the perforating device being moistened with an activating liquid for the adhesive employed. In the resulting envelope strip, the pockets have their bottom edge 40 as well as their side margins 41, secured together in face-to-face relation by the adhesive. The narrower marginal portion 42 adjacent the web margin 37 can be severed if desired and removed along the line of perforations 39.

Similarly, my process can be applied for securing together two or more sheets of any kind in a pack along a single margin, said sheets having an inactive adhesive of the type used in my process between each pair of plies and covering the area to be bonded, by perforating the sheets at such areas with a perforating instrument moistened with an activating liquid for the adhesive.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. The method of fastening together a pair of superposed plies of stationery having on a surface of at least one of said plies in contact with the other ply, an area carrying an inactive adhesive susceptible to activation by a treatment with an activating liquid, which comprise perforating the superposed plies through said adhesive-bearing area; simultaneously introducing activating liquid for said adhesive between said plies through the resulting perforations; and pressing said plies together adjacent said perforations.

2. The method of locally fastening together a pair of superposed plies of stationery having on the surface of at least one of said plies in contact with the other ply, an area carrying an inactive adhesive susceptible to activation by treatment with an activating liquid which comprises perforating the superposed plies through said adhesive-bearing area with an instrument moistened with said activating liquid; and pressing said plies together adjacent the resulting perforations.

3. The method of making continuous form stationery in which a pair of plies are secured together at form length intervals along weakened severance lines, which comprises superposing a pair of continuous plies of stationery, at least one of said plies having an inactive adhesive, susceptible to activation by treatment with an activating liquid, on its surface facing the other ply, said adhesive extending at least over the areas adjacent said severance lines; perforating said superposed plies along said severance lines with a perforating member moistened with an activating liquid for said adhesive; and pressing the superposed plies together adjacent the resulting lines of perforation.

4. The method of making a continuous envelope strip constituted by a longitudinally folded continuous web having transverse weakened severance lines at form length intervals, the superposed plies of said web being adhered together adjacent said transverse severance lines, which comprises longitudinally folding a web having on the inner surface of at least one of said plies an inactive adhesive susceptible to activation by treatment with an activating liquid, extending at least over an area including said transverse severance lines; perforating the superposed plies along said severance lines; simultaneously introducing an activating liquid for said adhesive through the resulting perforations between said plies; and pressing said plies together adjacent the transverse lines of perforation.

5. The method of making a continuous envelope strip constituted by a longitudinally folded continuous web having transverse weakened severance lines at form length intervals, the superposed plies of said web being adhered together adjacent said transverse severance lines, which comprises longitudinally folding a web having on the inner surface of at least one of said plies an inactive adhesive susceptible to activation by treatment with an activating liquid, extending at least over an area including said transverse severance lines; perforating the superposed plies along said severance lines with a perforating member moistened with an activating liquid for said adhesive; and pressing said plies together adjacent the resulting transverse lines of perforation.

6. The method of making a continuous envelope strip constituted by a longitudinally folded continuous web having transverse weakened severance lines at form length intervals, the superposed plies of said web being adhered together adjacent said transverse severance lines, which comprises longitudinally folding a web having an inactive adhesive coating on its inwardly folded surface; transversely perforating the superposed plies along said severance lines at form length intervals with a perforating member moistened with said activating liquid; and pressing said plies together adjacent the resulting transverse lines of perforations.

7. The method of making a continuous envelope strip constituted by a longitudinally folded continuous web having transverse weakened severance lines at form length itnervals, the superposed plies of said web being adhered together adjacent said transverse severance lines, which comprises longitudinally folding a web having an inactive adhesive on the inwardly folded surfaces of the resulting plies, extending at least over the area adjacent said transverse severance lines; perforating the superposed plies along said severance lines; simultaneously introducing an activating liquid for said adhesive between the plies through the resulting perforations; and pressing said plies together adjacent the resulting transverse lines of perforation.

8. The method of making a continuous envelope strip constituted by a longitudinally folded continuous web having transverse weakened severance lines at form length intervals, the superposed plies of said web being adhered together adjacent said transverse severance lines, which comprises folding a web having an inactive adhesive susceptible to activation by treatment with an activating liquid on the inner surface of at least one of said plies, extending over stripes including said transverse severance lines; transversely perforating the superposed plies along said severance lines with a perforating member moistened with an activating liquid for said adhesive; and pressing said plies together adjacent the transverse lines of perforations.

9. In an apparatus for securing together a pair of superposed plies of stationary, having on at least one of said plies an inactive adhesive susceptive to activation by treatment with an activating liquid on the surface of the ply facing the other ply; perforating means for perforating said plies through said adhesive area; and means for simultaneously introducing an activating liquid for said adhesive between the plies through the resulting perforations.

10. In an apparatus for securing together a pair of superposed plies of stationary, having on at least one of said plies an inactive adhesive susceptive to activation by treatment with an activating liquid on the surface of the ply facing the other ply; perforating means for perforating said plies through said adhesive area; and means for moistening said perforating means with said activating liquid, prior to perforating operation of said perforating means.

11. In an apparatus for securing together a pair of superposed plies of stationary, having on at least one of said plies an inactive adhesive susceptive to activation by treatment with an activating liquid on the surface of the ply facing the other ply; perforating means for perforating said plies through said adhesive area; means for moistening said perforating means with said activating liquid, prior to perforating operation of said perforating means; and means for pressing the superposed plies together adjacent the resulting perforations.

12. In an apparatus for securing together a pair of plies of stationary, at least one of which is provided with an inactive adhesive susceptible to activation by an activating liquid on an area of at least one ply in contact with the other ply, and for forming a weakened severance line therein, means for perforating said web along a severance line transversing said adhesive coated area; means for simultaneously introducing an activating liquid for said adhesive between the plies through the resulting line of perforations; and means for pressing said sheets together adjacent the resulting line of perforations.

13. In an apparatus for securing together a pair of plies of continuous form stationary having on areas of at least one of said plies an inactive adhesive susceptible to activation by treatment with an activating liquid, means for advancing said stationery; means for perforating said plies along a severance line; and means for simultaneously introducing an activating liquid for said adhesive through the resulting perforations.

14. In an apparatus for securing together a pair of superposed plies of continuous form stationery having on either side of transverse severance lines, at form length intervals, on the surface of at least one of said plies in contact with the other ply, an area of inactive adhesive susceptible to activation by treatment with an activating liquid; means for advancing said plies of stationery; a perforated member; means for activating said member to perforate the superposed plies along said transverse severance lines; means for moistening said perforating member with an activating liquid for said adhesive prior to each perforating operation; and means for pressing said plies together adjacent the resulting lines of perforations.

15. In an apparatus for securing together a pair of superposed plies of continuous form stationery having on either side of transverse severance lines, at form length intervals, on the surface of at least one of said plies in contact with the other ply, an area of inactive adhesive susceptible to activation by treatament with an activating liquid; means for advancing said plies of stationery; a perforated member; means for activating said member to perforate the superposed plies along said transverse severance lines; a wick for contacting said perforating member prior to each perforating operation thereof; and means for moistening said wick with an activating liquid for said adhesive.

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