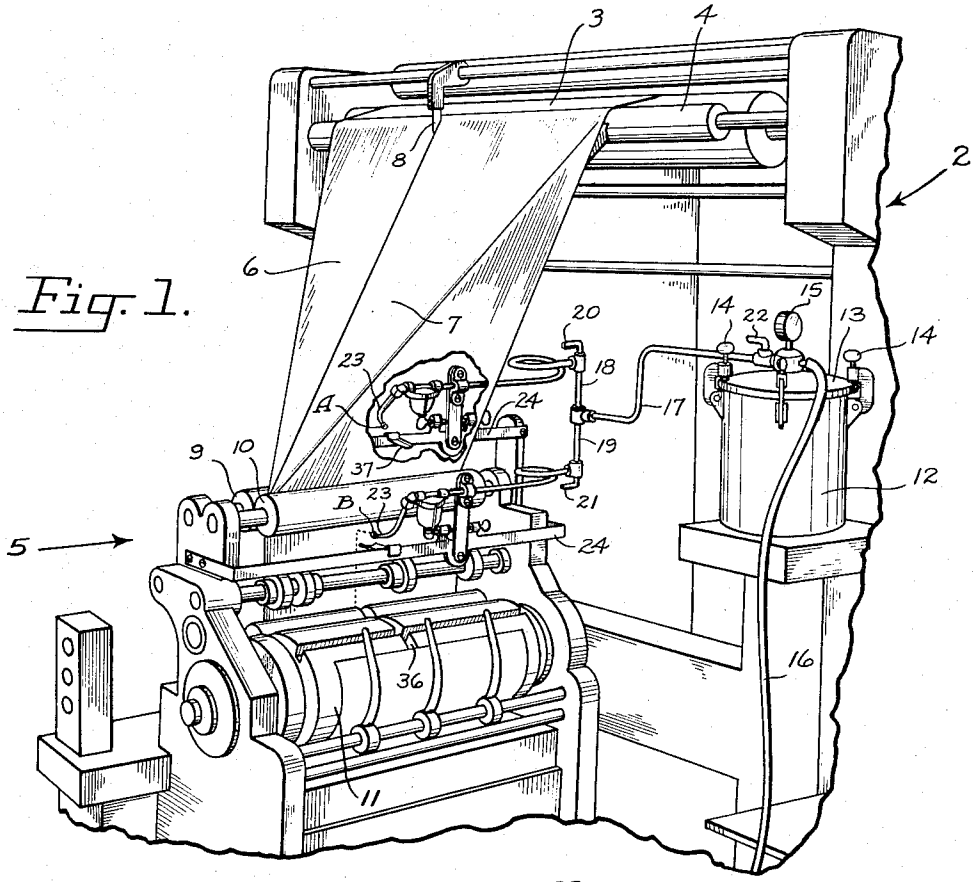
May 29, 1956 J. R. MARSHALL, JR 2,747,865

BOOKLET FORMING MEANS AND METHOD

Filed June 2, 1951

2 Sheets-Sheet 1

Fig. 1.



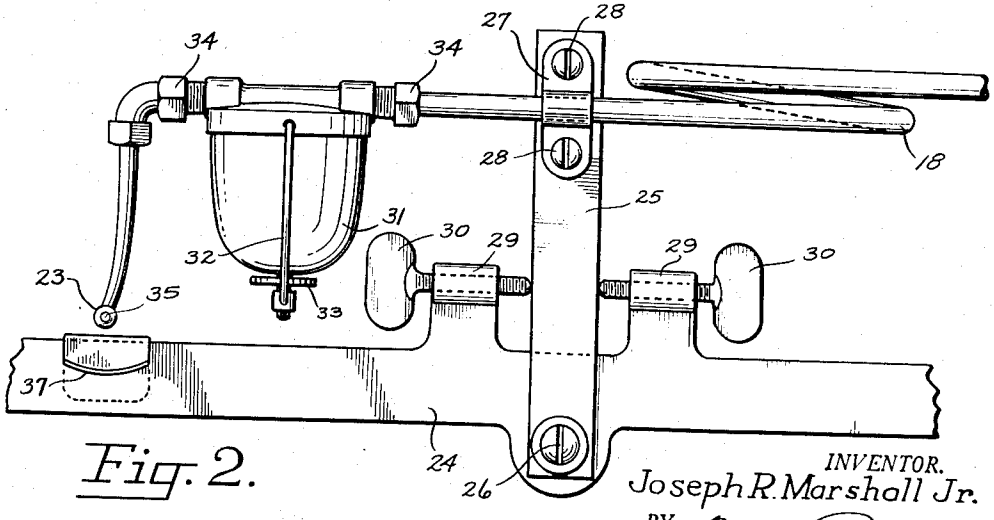


Fig. 2.

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2 Sheets-Sheet 2

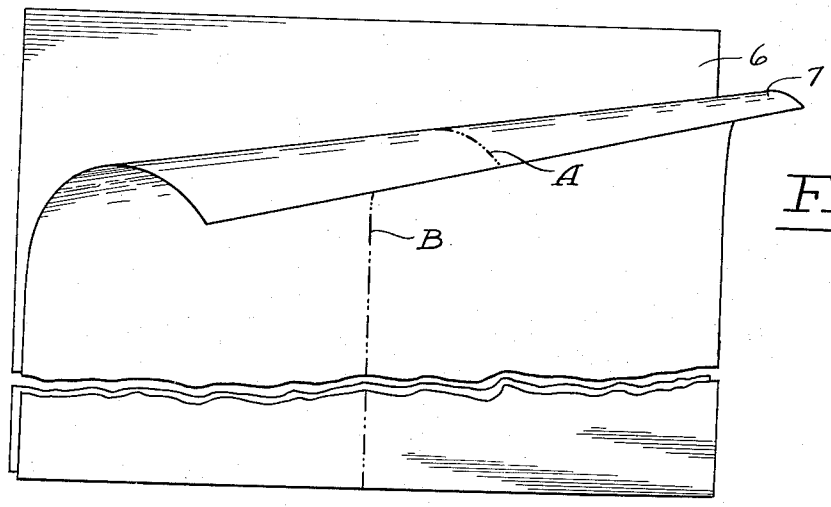

Fig. 3.

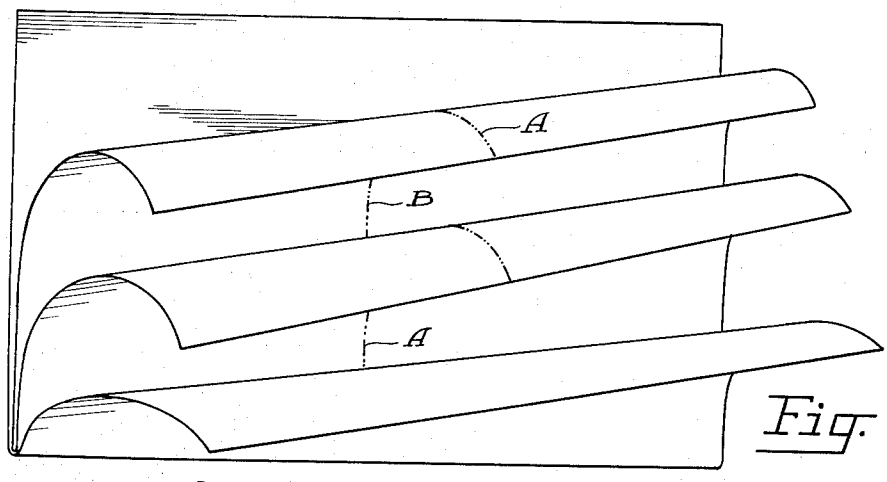

Fig. 4.

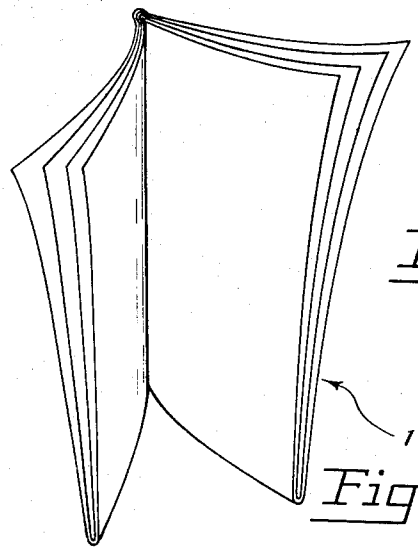

Fig. 5.

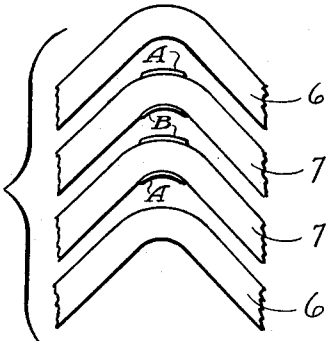

Fig. 6.

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BOOKLET FORMING MEANS AND METHOD

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Application June 2, 1951, Serial No. 229,560

7 Claims. (Cl. 270—32)

This invention relates to a method for applying a thin line of liquid adhesive to a sheet of paper in such a manner that the width and thickness of the line accurately may be controlled and limited to minute tolerances. More specifically, this invention is set forth in conjunction with the adhesive binding of multipage booklets wherein the quality of the finished product is related directly to the method and quality of the binding. This latter factor, in turn, is proportional to the control and neatness evidenced in the application of the binding adhesive to the sheet or web of printed paper prior to the folding step in the booklet assembly.

The printing industry generally classifies all printed matter as either a single sheet, a folder, a book, or variations thereon. Within the folder classification are included booklets, leaflets, and advertising broadsides of many diverse types, each constituting four or more pages folded from a single printed sheet or web. Thus, by way of example, a sixteen-page advertising booklet initially may be printed on a continuous web by an offset or stereotype press. After leaving the press, the web is slit once, folded three times, trimmed and bound to produce an eight-sheet, sixteen-page booklet. It is in combination with the folding of such a booklet and with the binding thereof that I have chosen to illustrate the advantages of my invention, although it will be evident that such advantages also can be made to flow to other applications of liquid adhesive.

In survey of the methods hitherto practiced in the binding of folders and booklets, wire stitching or stapling appears to be most popular, followed by thread or decorative floss sewing methods and pasting or gluing, in that order. My experience as a master printer, however, has lead to the recognition of certain disadvantages inherent in each such pior art binding method. Thus, metallic wire today is becoming in increasingly short supply, it is an expensive binding and the practice of this binding method requires the employment of extra help, all to the printer's detriment in a highly competitive field. Sewing by thread or decorative floss, on the other hand, is prohibitive competition-wise, since this binding is even more expensive than wire binding. It is for this reason that a majority of all bound advertising folders, booklets, and pamphlets have either wire, paste, or glue bindings.

Turning to the least expensive and most satisfactory method of binding, paste or glue hitherto most commonly has been applied with a grooved roller wheel which dips into a well and rolls over the surface of the printed paper sheet. The long, thin paste or glue line thus produced defines the binding line about which the printed sheet is folded to stick together companion pages and form a booklet binding. A three-fold disadvantage flows from the application of a binding adhesive in this manner, toward the alleviation or elimination of which my invention is directed in its more broad concept.

Firstly, the conventional paste roller, when used with a continuous web-tpye printing press, must be geared to

or otherwise synchronized with the press, so the peripheral velocity of the roller will match the lineal speed of the moving web. Were these speeds not correlated, the adhesive binding line would vary in thickness and produce a nonuniform booklet. However, such correlation requires an expensive and complex gear train or the like which can be eliminated entirely in my inventive structure. Secondly, a paste well, roller, and associated mechanism must be thoroughly cleaned after each operation or at the end of each day's shift. Since the paste used is a thick, sticky substance which hardens with exposure to the air, considerable time is lost at the end of each day or operation in performing such cleaning tasks. To cite but one advantage then, my invention allows the printing crew engaged in the formation of booklets to work the full shift in performance of their prime objective rather than, as with a paste roller, requiring them to stop a half or one hour early to clean a multiplicity of paste wells, wheels, gears, and associated mechanism. In summation, the above disadvantages have launched my inquiry into a better method and means for applying adhesive in the binding of booklets.

The third item of prior disadvantage flows directly in inhibition of the quality and substance of the finished booklet. Thus, two factors bound the selection and quality of a paste or glue-type booklet binding. Firstly, durability and the ability to withstand that usage for which it is intended mark the production of a first-class binding. Secondly, within the bounds of durability, the wider the booklet pages can open and the more flat they will lie when opened, the easier it is to read the printing and the better the binding. The conventional roller method of adhesive application falls short of the desired efficiency in both these factors. Thus, the very nature of the thick paste or glue and the inherent manner of mechanical application cause the adhesive binding line to vary, over a wide range, in width, thickness, and continuity. That is to say, the amount of adhesive applied by a roller is extremely difficult to control. Not only does the heavy paste or glue tend to ball up, slop over, and vary in consistency, but the roller wheel picks up small impurities such as dust particles and, thereafter, the roller periphery tends to skip or sluff over spaces on the printed paper web or sheet. Such fluctuations and variations produce a booklet of nonuniform quality in which one unit of production may open wide and lie flat, whereas another will be glued shut an excessive amount and yet another may be glued over only a portion of the intended binding line.

Accordingly, it is a prime object of my invention to provide a method for applying a liquid adhesive to a web or sheet in such a manner and with such control that the binding line thereby formed will be accurate within minute tolerances and will be uniform throughout a prolonged run or operation.

To this end, my inventive structure includes a hollow nozzle member having a fine orifice for emitting a thin, controlled jet of liquid. This nozzle is spaced a short distance from and is aimed toward the printed web or sheet of paper. Further, I prefer to uitilize a thin, easy flowing adhesive, such as a dextrin base glue, and to feed this adhesive to the nozzle under pressure from a large supply tank. Thereafter, the printed web or sheet is moved past the nozzle at a uniform velocity to intercept the jet of adhesive and to define a thin, straight binding line. By regulating and adjusting the orifice opening, the pressure, the spacing of the nozzle and web, and the consistency of the adhesive, I obtain a binding line of preselected, exact dimensions. In fact, the width and thickness of this line are controllable, with my inventive structure and/or in practice of my inventive method, to a few thousandths of an inch. Accordingly, there

results a booklet of high quality, which will open wide and lie flat. Further, this improved booklet will be of uniform quality throughout the run so that thousands of bindings of identical structure will result.

A further object of my invention includes the provision of a structure or means, in combination with a paper folder, for forming and binding a multipage booklet from a single printed sheet of paper, said booklet to be possessed of the advantages and to be provided in solution to the problems heretofore mentioned.

These and other objects and advantages of my invention will be set forth in the following detailed description, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a perspective view, partially broken away, showing a conventional offset press for printing a continuous web, a conventional rotary cylinder folder for forming booklets therefrom, and a jet-type nozzle and associated inventive mechanism as applied to and as used in conjunction with these conventional structures;

Fig. 2 is a detail view of a nozzle, conduit, and filter, for emitting a continuous thin jet of liquid adhesive and this figure further indicates one of the adjustment mechanisms for use with the aforementioned structure;

Figs. 3 and 4 are related perspective views of one slit web (or of two separate webs) showing the thin, continuous lines of adhesive applied thereto to define the binding line in the formation of a booklet and these figures indicate, diagrammatically, the sequential steps in the folding of such a booklet;

Fig. 5 is a perspective view of a booklet completely folded and showing the binding thereof somewhat exaggerated to illustrate the principles of this invention; and

Fig. 6 is a detail section view, through the binding of a booklet with the pages spaced somewhat and exaggerated in size, and illustrating the width and thickness of the adhesive binding line formed in accord with my inventive method.

As previously mentioned, the advantages of the instant invention are best illustrated with reference to the formation of an adhesive bound booklet, such as is indicated in the untrimmed condition at **1** in Fig. 5. To this end, I have shown (Fig. 1) a conventional offset press **2** for printing a continuous web of paper **3**. The specific details of this press are immaterial and, in fact, I have illustrated only the end or off-bearing rollers thereof **4** whereby a continuous web having a reoccurring printed pattern is fed toward a magazine or rotary cylinder-type folder **5**. Thus, the basis for my improved method and means will be bottomed upon the following description of the conventional parts of the press **2** and folder **5**.

As the continuous web **3** leaves the offbearing side of the printing press **2**, it is slit longitudinally into two continuous sheets or webs, **6** and **7**, as by the knife **8**. Thereafter, two feed and guide rollers **9** and **10** fold the slit webs **6** and **7** face to face and pull them through the folder **5** to define a web or sheet propelling means. At the lower end of the folder, a blade (not shown) clips off a measured quantity of the abutting webs and folds them by a tuck and wrap-around movement in the rotary cylinder **11**. This cylinder, in turn, discharges the folded webs to the left, as shown in Fig. 1, where another fold, trimming operations, etc., thereafter may take place to complete a multipage booklet or pamphlet. As above described, of course, the webs have not been glued so the finished booklet or pamphlet will not be bound but rather will be stuffed together in the form of a newspaper. This, then, is an outline of a typical operation with a conventional press and folder.

Turning now to my improved method and means, a hollow adhesive or glue container **12** is mounted adjacent a conventional printing press and folder. This container includes a pressure-type lid **13** having adjustable tie-down dogs **14** for holding it in place and provided with a pressure gauge **15**. An air supply conduit **16** and a glue or

liquid adhesive feed conduit **17** lead into and out of the hollow container **12** through appropriate apertures in the lid **13**.

Progressing along the conduit **17**, it is branched to define two liquid adhesive feed lines **18** and **19** having control valves **20** and **21**, respectively. Additionally, a master control valve **22** is provided in the supply line **17**. These valves, in combination, define a means for controlling and regulating the volume of liquid adhesive which flows through each of the respective conduits.

As shown in Fig. 1, each of the feed lines **18** and **19** supplies an identical nozzle structure **23**. Accordingly, a description of but one of these nozzles will suffice.

To this end, Fig. 2 indicates the manner in which the feed line **18** is supported upon a cross frame member **24** secured to the magazine-type folder **5**. An elongated, vertical pivot bar **25** is mounted upon the frame member **24**, as by the pivot pin **26**. Adjacent the upper end of this bar, an apertured bracket **27** grips the feed line **18** and is secured to the bar, as by a plurality of screws **28**. Additionally, two upstanding ears **29** are carried by the frame member **24**, one adjacent each side of the pivot bar **25**. A threaded thumb screw **30** cooperates with screw threads formed within an aperture through each of the ears **29** to bear upon the pivot bar **25** and adjust the same pivotally. Thus, to swing the pivot bar **25** and nozzle **23** laterally to the right in Fig. 2, the right-hand thumb screw **30** is backed off and the left-hand thumb screw **30** is tightened. Such lateral adjustment is essential to the correct positioning of the thin adhesive binding line with respect to the printed web.

As shown in Fig. 2, I prefer to insert the bowl **31** of a hollow ceramic or other conventional type filter intermediate the nozzle **23** and the feed line **18**. This filter bowl removably is held in place by a pivotable U-shaped bracket **32** and a knurled knob **33**. Additionally, the entire filter mechanism is interposed in the line **18** by means of a pair of threaded couplings **34**. The need for a ceramic or other, equally efficient, filter such as is shown at **31** will be obvious when it is remembered that one of the disadvantages of the prior, roller-type adhesive applicator was the nonuniform binding line hitherto produced. This roller often skipped spaces and for that reason produced a booklet of uncertain quality. Thus, in conjunction with the nozzles **23**, my invention utilizes a thin, liquid adhesive, such as a water soluble, dextrin base glue. This adhesive is fed under pressure to the nozzles **23** from which it must issue in a pair of continuous jets of controlled volume and area. The filter **31** serves to filter out any impurities and lumps which may be present in such an adhesive. Further, referring to the orifice **35** which is formed in each of the nozzles **23**, the diameter of this orifice is only 8 to 12 thousandths of an inch, depending upon the velocity with which the web is to pass by the nozzle. This small diameter is necessary to produce a fine, thin jet. Thus, the filter **31** serves to prevent clogging of the small orifice whereby continuity of operation is assured.

Continuing with reference to Figs. 1 and 2, a drip cup **37** is secured to the cross frame member **24** immediately below each nozzle **23**. These drip cups prevent inadvertent operation of the pressurized adhesive applicators from soiling the folder mechanism. Further, the rotary folder cylinder **11** is grooved peripherally, as at **36**, to straddle the thin adhesive binding line which is formed prior to the folding operation. Thus, the periphery of the cylinder **11** will not contact the wet adhesive binding line during a folding operation.

The operation of my novel pressurized glue or adhesive applicator will be explained in combination with the conventional printing press **2** and folder **5**. To this end, I have applied the letter A to the upper nozzle **23** and the letter B to the lower nozzle. Further, in Figs. 3, 4 and 6, the letter A has been applied to the thin adhesive binding line traced along the inner face of the web **7** by the jet

issuing from the nozzle A. Similarly the thin adhesive binding line B is formed by the jet emitted from the nozzle B. In function, the off-bearing roller 4 and the feed and guide rollers 9 and 10 define an elongated path of movement for the web 3 and for the slit webs 6 and 7. This path of movement carries the web 7 past the two nozzles A and B and into the folder together with the web 6. During such passage, of course, a thin, controlled jet of adhesive will issue from the nozzles to define and to form the adhesive binding lines about which the webs are to be folded in the formation of a multipage booklet.

In practice, an air pressure of approximately 45 pounds per square inch is forced through the air supply conduit 16 by means of a compressor or other mechanism. This pressure forces the liquid adhesive in the container 12 to flow past the master control valve 22, through the adhesive supply conduit 17, through the branch feed lines 18 and 19, and out the nozzles A and B. In this connection, it will be noted that a combination of varying factors control the width and thickness of the adhesive binding lines A and B traced along the moving web 7. These factors include the velocity at which the web moves past the nozzles, the air pressure on the adhesive supply tank, and the temperature and consistency of the liquid adhesive. Further, by regulating the spacing between each orifice 35 and the surface of the moving web and by selecting an orifice of predetermined opening, the jet and web interception area may be controlled. This controls the width of the binding line. A further control is effected by regulating the pivot bar 25 to place the orifice and jet exactly intermediate the margins of the web 7. This spacing is essential to define an exact and controlled adhesive binding line about which the web is later to be folded in the formation of a booklet.

Referring now to Figs. 1, 3 and 4, the continuous web 3 first is slit longitudinally down the center by the knife 8. Sequentially thereafter, the upper nozzle A emits a thin jet to trace the adhesive binding line A down the middle of the inside surface of the web 7, the webs 6 and 7 are glued together in face-to-face relationship as they pass between the feed and guide rollers 9 and 10 (this compression spreads the binding line laterally a small amount), and the lower nozzle B defines a second adhesive binding line down the middle of the exterior surface of the web 7. Thereafter, the rotary cylinder 11 cuts off the webs 6 and 7 to form the twin sheet structure shown opened up in Fig. 3. This twin sheet structure is then folded to form the four-sheet structure shown opened up in Fig. 4. However, it should be noted that during this folding operation, the peripheral groove 36 straddles the adhesive binding line B to prevent contact of this line with the cylinder. Finally, the four-sheet structure of Fig. 4 is folded once again to form the eight-sheet, sixteen-page structure of Fig. 5. Actually, of course, the printing press, adhesive jets and folder all run continuously to form many hundreds or thousands of booklets, one after another.

In summation, my inventive method for forming a multipage booklet from a single sheet or web of paper includes the sequential manipulative steps of providing or defining, by means of the rollers 4, 9 and 10, an elongated straight path of movement past the nozzles A and B, providing a pressurized supply of liquid adhesive joined to a nozzle orifice means to direct a continuous thin jet of liquid adhesive toward said path of movement, and moving the web or sheet of paper along this path at a uniform velocity in interception with the jet. This movement causes each of the jets issuing from the nozzles A and B to define straight adhesive binding lines of constant width and thickness medial the margins of the web or sheet. Further, this constant width and thickness is adjusted by controlling the pressure upon the nozzle, by spacing the nozzle a selected distance from the surface of the sheet and from the path of movement to define a jet interception of preselected extent, and by aiming the nozzle and jet medial the margins of the path of movement.

As above described, a multipage booklet has been formed, by the practice of my inventive method, from a continuous web or webs of paper. However, it is to be noted that a similar booklet could be formed from a single sheet in much the same manner. Thus, some print shops will prefer first to print a large stack of single sheets. Thereafter, these sheets may be fed individually along a path of movement underneath a nozzle which emits a thin jet of liquid adhesive in accord with the above described invention. This glued sheet then may be folded longitudinally along the adhesive binding line and laterally thereacross to form a multipage booklet about said adhesive line as a binding. However, whether a continuous web or a single sheet of paper is utilized, the nozzles 23 and orifices 35, together with some movement producing mechanism, will define a thin line of liquid adhesive having a width and thickness controlled and limited to minute tolerances. Such control and such tolerances are impossible with those structure and methods hitherto known. Thus, my invention serves both as a liquid adhesive applicator and as a binding method to produce a finished booklet of high quality and durability. Those printers engaged in the production of booklets, leaflets, and advertising broadsides immediately will recognize the economic and quality of product factors flowing from this invention.

I claim:

1. In combination with a paper folder for forming a multipage booklet from a sheet of paper, a pressurized liquid adhesive applicator means including a hollow nozzle member having a fine orifice means for emitting a controlled thin jet of liquid adhesive without admixture with air or other gas, and means for moving a sheet of paper past said jet at a uniform velocity and in a straight line to trace and to define a thin, straight line of adhesive over said sheet and paper folder means for associating an additional sheet section with said sheet, to be secured thereto along said line of adhesive, and subsequently folding said two sections along said line of adhesive to form a multipage booklet about said line of adhesive as a binding.

2. In combination with a paper folder for forming a multipage booklet from a sheet of paper, a pressurized liquid adhesive applicator means including a fine orifice less than twelve one thousandths inch in diameter adapted to emit and to direct a thin jet of liquid adhesive under pressure without admixture with gas, means for moving a sheet of paper past said jet at a uniform velocity to trace and to define a thin, straight line of adhesive over said sheet, and paper folder means for associating an additional sheet section with said sheet, to be secured thereto, along said line of adhesive, and for subsequently folding said two sections along said line of adhesive to form a multipage booklet about said line of adhesive as a binding.

3. In combination with a paper folder for forming a multipage booklet from a single sheet of paper, a pressurized adhesive applicator means including a hollow nozzle member having a fine orifice means for emitting a controlled thin jet of liquid adhesive under pressure without admixture with gas, and means for moving a sheet of paper past said jet at a uniform velocity and in a straight line to trace and to define a thin, straight line of adhesive over said sheet, said line being traced longitudinally down the center of said sheet from end to end, and paper folder means for associating an additional sheet section with said sheet, to be secured thereto, along said line of adhesive, and for subsequently folding said two sections along said line of adhesive to form a multipage booklet about said line as a binding.

4. In the art of forming a multipage printed booklet of superior binding quality from a continuous web of

paper, the method steps comprising moving a continuous web of paper along a straight path in a constant direction at a uniform high velocity, forming a thin jet of liquid adhesive at a fixed distance from said web by forcing the liquid adhesive under pressure past a filter and through a small orifice without an admixture with gas, and continuously directing said jet against said moving web of paper in interception thereof intermediate the lateral boundaries of the web to define a straight unbroken thin line of adhesive marking a folding line associating an additional sheet section with said sheet to be secured thereto along said line of adhesive, and subsequently folding said two sections along said line of adhesive to form a booklet.

5. The method of claim 4 wherein the diameter of said orifice during the practice of said method is fixed and is less than twelve one thousandths of an inch.

6. In the art of forming multipage booklets with adhesive binding, the method of applying the adhesive which includes providing a continuous web of paper, forming a plurality of thin jets of liquid adhesive of constant consistency by forcing the liquid adhesive under pressure through a plurality of small spaced orifices of uniform constant diameters without an admixture with gas, adjusting the pressure upon said adhesive to deliver jets of preselected and finely controlled velocity and volume, and continuously directing said jets against opposite faces of said web of paper while providing straight

line constant velocity and relative movement between said orifices and said web in plural interception and definition of straight and unbroken thin lines of adhesive associating an additional sheet section with said sheet to be secured thereto along said line of adhesive, and subsequently folding said two sections along said line of adhesive to form a booklet.

7. The method of claim 6 wherein the diameter of each said orifice during the practice of said method is fixed and is less than twelve one thousandths of an inch.

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