

[54] **PAPER FOLDER**

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270/66, 86, 93, 94, 21; 93/8, 11, 12, 35, 84

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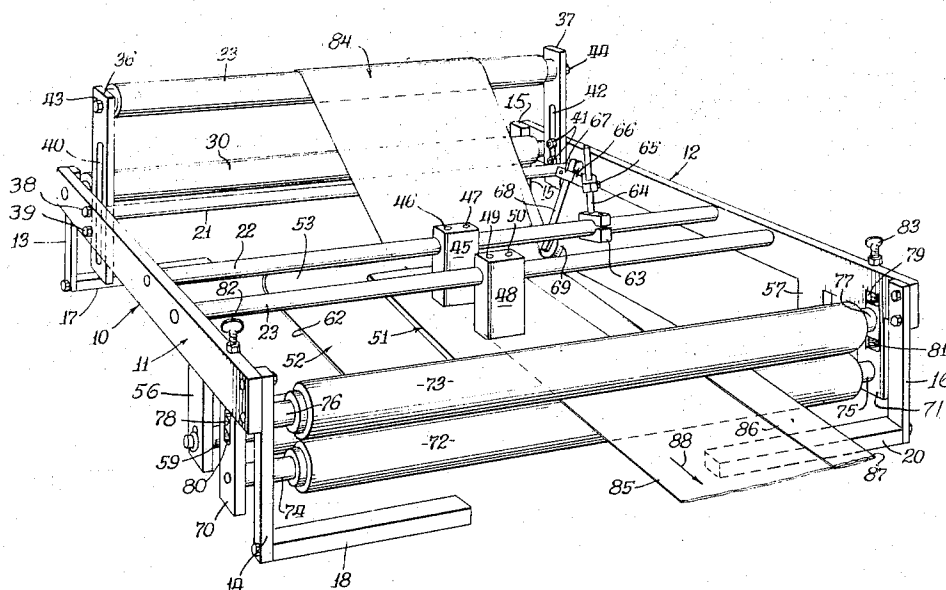
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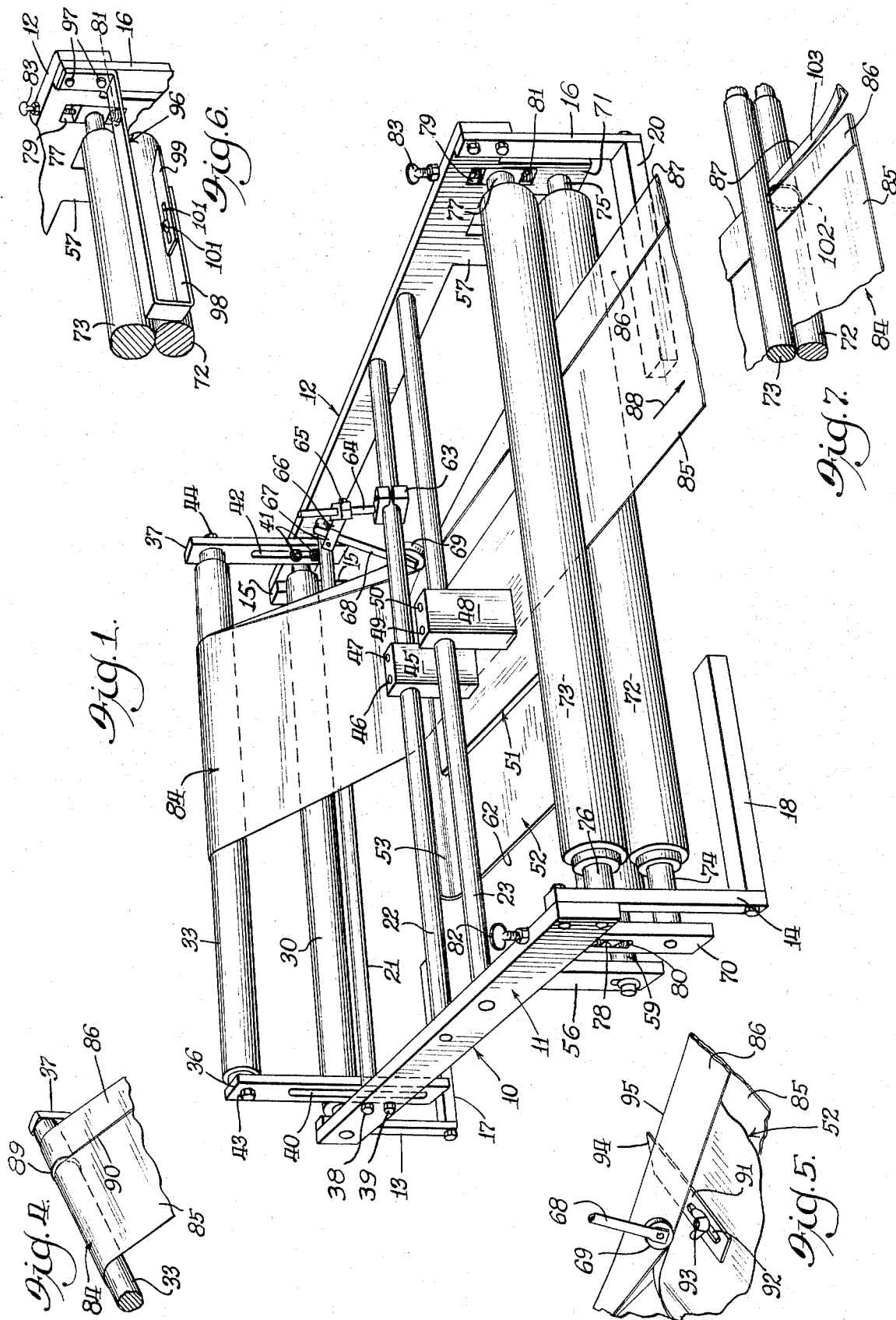
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ABSTRACT

A paper folder as used in the printing industry, usually done after printing has been applied to both sides of the paper. The folding is accomplished by bringing a strip of paper from an outwardly spaced position into a plane carrying paper folding mechanisms. The paper is folded over a straight side edge of a thin flat sheet. The side edge is disposed at a position offset from the side edge of the paper to be folded. A small diameter freely journaled roller is arranged to press a folded over portion of the paper against the flat sheet while the remaining or unfolded portion of the paper runs on the other side of the flat sheet. A pair of cooperative driven rolls pulls the paper through the folding operation. In addition to folding the paper the invention provides for the optional cutting of the folded over portion from the unfolded portion.

2 Claims, 7 Drawing Figures





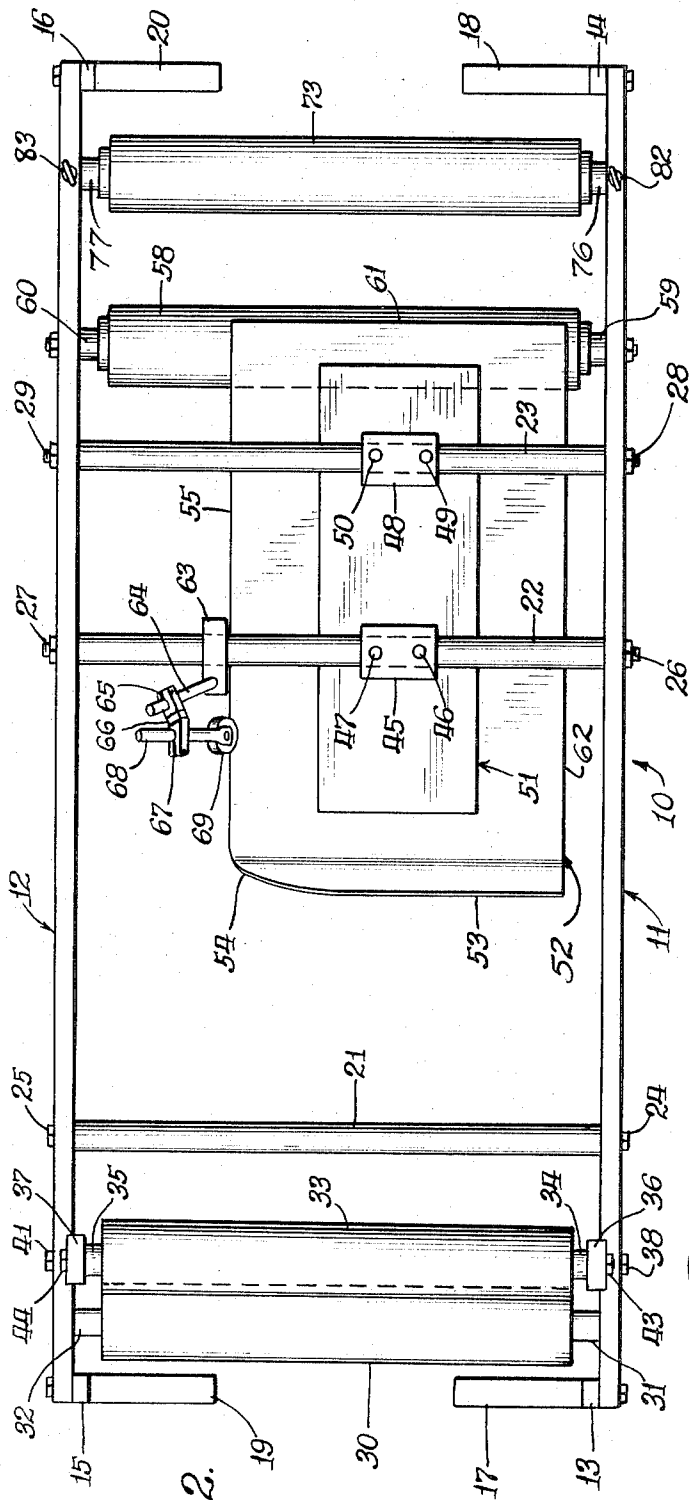


Fig. 2.

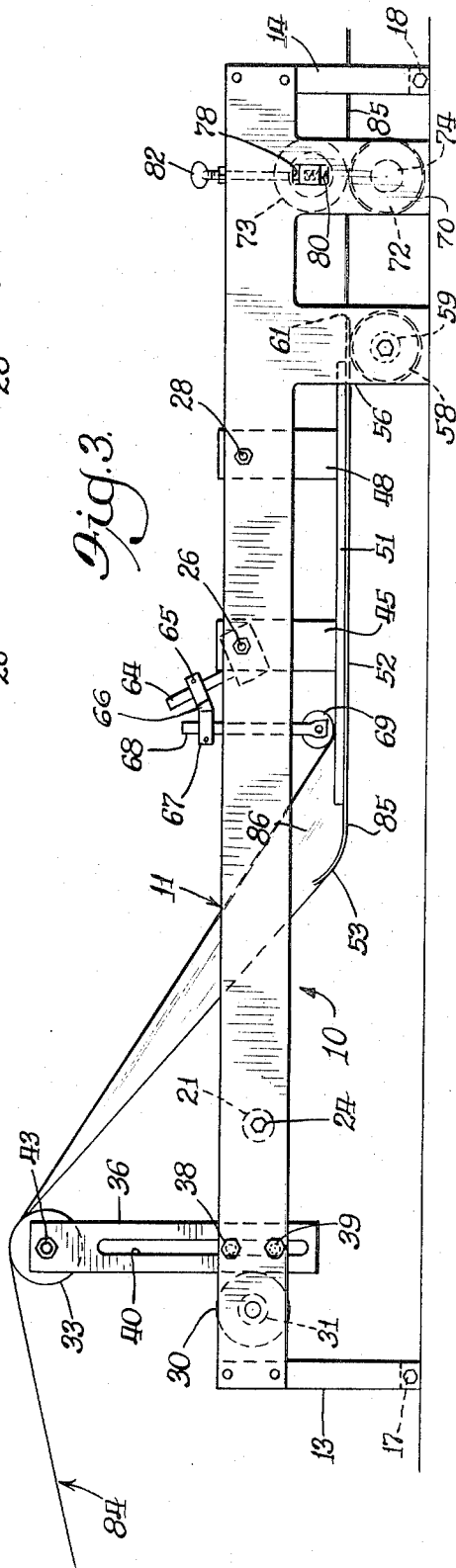


Fig. 3.

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PAPER FOLDER

BACKGROUND OF THE INVENTION

The folding of paper in the printing field has been done for many years but the mechanisms to accomplish such folding have been very complex and have required much room in which to operate. Prior folding has necessitated long runs of paper with multiple elements gradually turning the paper over upon itself. Also, when it was previously desired to place one sheet in a superposed position over another sheet it required long, wide paper turning bays whereas with the present device one paper sheet may be cut from a wide sheet and placed over the remainder of the sheet in a superposed position within the space of several feet rather than large bays.

The field of the present invention is in the folding and cutting of printed paper. In recent months the Sunday newspapers of the major metropolitan areas have been provided with special supplements made separately from the printing of the newspaper. These supplements or inserts usually solicit enrollment in medical insurance programs. The inserts are booklets with mailer reply cards folded therein or with actual envelopes formed integrally and folded within the booklet. It is with this type of work that the paper folder of this invention is primarily used.

SUMMARY OF THE INVENTION

A principal object of this invention is to provide a novel folder for paper in a long strip form.

An important object of this invention is to provide a plow for regularly turning over one side lateral strip of a long strip of paper so that the turned over portion lies directly above a lower unturned portion.

Another important object of this invention is the provision of a device as defined in the preceding object and further having a universally positionable roller for assisting in the paper fold over commenced by the plow.

Another and further important object of this invention is to provide a novel paper folder wherein a paper strip is inclined downwardly immediately prior to entering a plow to turn over one side edge of the paper strip and at the same time an angularly inclined presser roller aids in the paper turnover.

Another and still further important object of this invention is to provide a device as defined in the preceding object and wherein the folded paper strip is pulled through the plow and cooperative presser roller from a point beyond the plow.

Still another important object of this invention is to provide a novel paper turning plow in the form of a generally rectangular thin flat plate with an upwardly rolled leading edge and including a rearwardly curved corner constituting the plow.

Another and further important object of this invention is the provision of a novel paper folder having a laterally adjustable plow so that paper of any width may be folded as desired.

Still another important object of this invention is to provide a cutter in association with a plow type paper folder so separate paper strips may be positioned in superposed position relative to each other.

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Other and further important objects and advantages will become apparent from the following description and accompanying drawings. IN THE DRAWINGS

FIG. 1 is a perspective view of the paper folder of this invention.

FIG. 2 is a top plan view of the paper folder of FIG. 1.

FIG. 3 is a side elevational view of the paper folder of FIGS. 1 and 2.

FIG. 4 is a detail perspective view of a modified form of the paper folder in which the paper is cut along the line of the intended fold.

FIG. 5 is a detail perspective view of another modified form of the paper folder showing a severing of the folded over paper from the paper stock immediately after the fold is made.

FIG. 6 is a detail perspective view of still another modified form of severing the folded over portion of paper from the original stock.

FIG. 7 is a detail perspective view of another and still further modified form of severing the folded over portion of paper from the backing stock.

AS SHOWN IN THE DRAWINGS

The reference numeral 10 indicates generally a supporting framework for the paper folder of this invention. The frame support 10 includes transversely spaced apart longitudinally extending parallel side members 11 and 12. Each of the four corners of the generally rectangularly shaped device defined by the side frame members 11 and 12 is provided with a depending leg for surface support in the event the folder is intended to be carried on a surface. However, it should be understood that the device may be suspended from some upper support if that is more convenient. Legs 13 and 14 are shown attached to and depending respectively from the ends of the side member 11. Similarly legs 15 and 16 are shown attached to and depending respectively from the ends of the side member 12. Surface engaging feet 17 and 18 are provided on the lower ends of the legs 13 and 14 respectively. The feet project inwardly toward each other. Similarly, surface engaging feet 19 and 20 are provided on the lower ends of the legs 15 and 16 respectively and again the feet project inwardly toward each other.

The supporting structure 10 further includes longitudinally spaced apart transversely disposed spacer rods 21, 22, and 23 which are positioned between the side frame members 11 and 12 and thus determine and hold the side frame members in fixed relationship. Nuts 24 and 25 threadedly engage the threaded extensions of the rod 21 on the outside of the frame members 11 and 12. This causes a drawing of the sides 11 and 12 snugly up against shoulders provided on the rod at the inner ends of the threaded extensions. Similarly nuts 26 and 27 corresponding to the nuts 24 and 25 are provided for cooperation with the rod 22. Still further nuts 28 and 29 are provided for the rod 23 and thus when all of the nuts are drawn up tightly the supporting structure for the paper folder of this invention is very rigid and is capable of holding the folder mechanisms in fixed positions for the uniform and accurate folding of paper.

A first paper guiding roller 30 has reduced diameter ends 31 and 32 which are journally mounted in the spaced apart side frame members 11 and 12 at the ends thereof adjacent the legs 13 and 15. A second paper

guiding roller 33 has reduced diameter ends 34 and 35 for journal mounting of the roller in the upper ends of parallel upright supporting arms 36 and 37. Vertically spaced apart bolt and nut assemblies 38 and 39 pass through upper and lower edge portions of the side frame member 11 and through an elongated slot 40 disposed generally vertically in the upright arm 36. The upright arm 36 may thus be adjusted for locking in any desired vertical elevation. Similarly bolt and nut assemblies 41 corresponding to the assemblies 38 and 39 pass through upper and lower edge portions of the side frame member 12 and through an elongated slot 42 in the upright arm 37 for locking that upright in a desired vertical position at any selected height. Of course it is desirable to have the upright arms 36 and 37 adjusted to an equal height to thereupon establish the roller 33 in a horizontally level position.

As best shown in FIGS. 1 and 2 the paper folder of this invention includes a generally vertically disposed block 45 which has a transverse passageway to receive and slide on and along the spacer rod 22. Spaced apart set screws 46 and 47 are provided in the top of the block 45 for engagement with the rod 22. The construction of the block and the set screws permits the block to be adjustably positioned on the rod as desired. A similar vertically disposed block 48 has a transverse passageway to receive and slide on the supporting structure's spacer rod 23. The block 48 is located at a position spaced longitudinally from the block 45. Spaced apart set screws 49 and 50 are provided in the top of the block 48 and are used to adjustably position the block 48 on the rod 23. The two blocks 45 and 48 are jointly used to support a heavy plate 51. The plate 51 is disposed in a generally horizontal plane and is fastened to the undersides of the two blocks. A relatively thin generally flat plate or sheet 52 is provided on and fastened to the underside of the heavy plate 51. The plate 52 is generally rectangular in shape. A transverse edge 53 thereof facing the roller 33 is rolled or curved upwardly so that a strip of paper delivered from the roller 33 is smoothly guided to the underside of the thin plate 52. The corner 54 of the rolled edge 53 which is adjacent the side frame member 12 is curved around to the side 55 of the plate and constitutes a plow over which the paper is folded. The edge 55 extends longitudinally from the rolled edge 53 to the other end of the plate. This side edge 55 is generally parallel to the frame members 11 and 12.

Arms 56 and 57 are fixed to and depend from the side frame members 11 and 12 respectively. A roller 58 is carried on and between the arms 56 and 57. The roller is equipped with reduced diameter ends 59 and 60 which are journally mounted in the lower ends of the arms 56 and 57. A transverse edge 61 of the plate 52 is disposed opposite to and generally parallel with the rolled edge 53. The plate edge 61 is located immediately above the surface of the roller 58. The roller 58 thus gives stability to the plate 52 along the edge 61 and constitutes an upper surface guide for that part of the paper passing beneath the plate 52. The leading rolled edge 53 of the plow plate 52 is longitudinally spaced from the roller 33 causing paper from the roller 33 to enter the plow at a substantial inclination. The edge 53 and its corner 54 are adapted to conveniently receive the paper to be folded without tending to tear the paper. The plate 52 further includes another longitudinal side edge 62 which is generally parallel to the side edge

55 and is located adjacent the side frame member 11. The plate 52 may be adjusted laterally as desired between the side frame members 11 and 12 by loosening the set screws 46, 47, 49 and 50 and sliding the blocks 45 and 48 on the transverse rods 22 and 23. The fore and aft position of the plow plate 52 is generally fixed relative to the paper supply roll 33 but the fact the plow plate may be moved transversely means that the paper folder may be utilized to fold any desired width of paper.

A first adjustable clamp 63 is mounted on the spacer rod 22 and may be adjusted therealong as necessary to provide for the proper folding effect of the paper as will later be described. The clamp 63 carries a post 64 which in turn carries on its other end a second adjustable clamp 65. An arm 66 is adjustably carried on the second clamp 65. A third adjustable clamp 67 is carried on the arm 66. A post 68 is adjustably carried on the third clamp 67. A paper guiding roller 69 is freely journalled on the lower end of the post 68. The several adjustable clamps thus permit complete freedom in the positioning of the roller 69. The permitted movement of each clamp and the permitted movement of the posts or arms within each clamp provides for the universal adjustment of the roller 69. As shown in the drawings the roller 69 cooperates with the plow corner 54 to press the folded over portion of the paper down on the top side of the plate 52 and around the side edge 55 of the plate. The unfolded portion of the paper stock is guided by the rolled edge 53 to the underside of the plate 52.

Arms 70 and 71 are attached to and depend from the side frame members 11 and 12 respectively. The arms are disposed at a position closely spaced longitudinally from the depending arms 56 and 57. Cooperative paper feeding rollers 72 and 73 are journally carried in the arms 70 and 71 with the mating surfaces thereof disposed in general planar alignment with the plate 52. The lower roller 72 is provided with reduced diameter ends 74 and 75 for the journal mounting of that roller in the depending arms 70 and 71 of the side frame members 11 and 12. It is preferable that this lower roller 72 be driven by means (not shown) to cause a pulling of the paper to be folded through the folder. However, if a subsequent operation such as a gluer or a cutter is employed with means for pulling the paper then no drive need be applied to the roller 72. The upper roller 73 is provided with similar reduced diameter ends 76 and 77 which pass loosely through vertically elongated slots 78 and 79 in the arms 70 and 71 respectively. Springs 80 and 81 are disposed vertically in the slots 78 and 79 respectively above the end extensions 76 and 77 of the roller 73 to thus provide a spring bias of the upper roller 73 into engagement with the lower roller 72. Spring tensioning hand screws 82 and 83 respectively in the tops of the spaced apart side frame members 11 and 12 permit adjustment of the spring tension to determine the force of the contact of the upper roller with the lower roller.

As best shown in FIGS. 1 and 3 a paper supply 84 is shown passing over the paper guiding roller 33. The paper may be coming from a printing machine or other source or in the event the operation is only a folding the supply may be a roll of paper mounted on either the roller 30 or the roller 33. When the paper is delivered from some other machine it is preferable that the roller 33 around which the paper is passed be higher than the

source. If this were not true then the paper run would have to be passed around the roller 30 in the manner of an idler before being sent up to the roller 33. This provides that the path of the paper from the roller 33 to the leading rolled edge 53 of the plate 52 be a relatively constant angle of inclination. It has been found that the approximate angle as shown produces the most effective folding over of the side edge of the paper around the plow corner 54. Of course the angle of inclination of the path of the paper may be adjusted by raising or lowering the spaced apart supporting arms 36 and 37 relative to the side frame members 11 and 12. This angle may be changed for different folding jobs. The main body 85 of the paper 84 is fed around and under the rolled leading edge 53 to the underside of the plate 52. A lateral side edge portion 86 of the paper is folded over and around the plow corner 54 and is thus laid flat on the top side of the plate 52. The roller 69, properly adjusted, is used to guide the side of the paper over the plow corner 54 and down onto the top of the plate 52. The paper fold line is shown at 87 and defines the dividing line between the lower main body portion 85 of the paper and the upper folded over portion 86. An arrow 88 indicates the direction of pull on the paper stock 84 as it moves through the plow folder of this invention. As previously stated the pull may be provided by the spring biased feed rollers 72 and 73 or some other means as desirable.

OPERATION

The paper folder of this invention is as a rule used in conjunction with printing machines, gluers and cutters to produce printed and folded booklets. The folded portions may be made as envelopes embodied directly within the booklet. It has been the recent practice of many companies, such as insurance companies, to prepare advertisements as independent supplements to weekend newspapers. These supplements invariably have a reply envelope formed as an integral part thereof. The folder of this invention must thus be versatile and capable of folding accurate amounts of a preprinted paper strip so the result is a unitary booklet.

A paper strip, preferably preprinted, and shown at 84 is passed over the freely journaled roller 33. From this roller 33 the paper stock passes downwardly at an angle where it is received by the plow plate 52. The leading edge 53 of the plate 52 is rolled slightly upwardly and thus guides the paper 84 to the underside of the plate 52. That portion of the paper which goes to the underside is designated as 85 while the lateral side portion 86 which is folded over the top of the plate 52 is designated as 86. The paper is folded over and around the plow corner 54 of the plate 52 as the paper is pulled through the folder. The universally adjustable roller 69 cooperates with the plow plate 52 to press the paper angularly downwardly thus causing the lateral edge 86 to be bent over the top of the plate 52 thereupon making a clean accurate fold of the paper as that paper is pulled through the folder by the cooperative feed rollers 72 and 73 or by some external source of paper pulling power in the event the paper is to be subjected to another operation of some other type such as the applying of glue or making of perforations to selected portions of the folded paper to form envelopes as above discussed.

MODIFICATIONS OF THE INVENTION

As best shown in FIG. 4 a circular cutter 89 is provided on the roller 33. The position of the cutter is such that it severs the paper 84 into separate strips 85 and 86. The cut is made on a line 90 on the width of the paper 84 which is coincident with the bend line 87 when the paper is not to be cut and as described above. With this modification of the invention the folder is converted into a device for placing one strip of paper in a superposed position relative to another strip of paper.

FIG. 5 shows another modification of the invention in which the folded paper is cut into separate strips laying one on top of the other. In this instance the severing is made at a point immediately following the fold over where the roller 69 cooperates with the plow corner 54. A transversely disposed knife 91 having an elongated slot 92 in the shank thereof is supported on the upper surface of the plate 52. A wing nut and bolt assembly 93 is adapted to pass upwardly through the plate 52 and through the elongated slot 92 in the knife 91 to thereby adjustably hold the knife in any desired extended position of an outer end 94 of the knife 91. The line of cut is shown at 95 and is located between the bottom portion 85 of paper 84 and the top folded over portion 86. The cut or sever line 95 is in the same location as the fold line 87 when the paper is not severed as in FIGS. 1 and 3.

FIG. 6 shows still another modification for the cutting of the paper with the result there are two separate strips of paper superimposed one over the other. In this instance the location of the auxiliary cutter is just beyond the discharge of the cooperative paper feeding rolls 72 and 73. A bracket 96 is bolted or otherwise fastened at 97 to the leg 16 of the side frame member 12. The bracket 96 includes a lower horizontally disposed arm 98 which in turn carries and supports a transversely disposed knife 99. The knife is quite similar to the knife 91 of FIG. 5 and also is provided with an elongated slot 100. A bolt and nut assembly 101 is provided to adjustably hold the knife in a removable manner to the lower arm 98 of the bracket. Thus all three modifications of FIGS. 4, 5 and 6 result in the separation of the paper into upper and lower strands. It is only the location and type of cutter that has changed.

A still further modification is shown in FIG. 7 wherein a circular cutter 102 is provided on the roller 72 so that at the point of discharge from the folder the fold line 87 plus a small amount of laterally extending paper from both sides of the fold line is severed from the paper strips 85 and 86. The part cut off is identified as 103 and is generally U or C shape in cross section. Again the overall result is the same as that defined for the cutters of FIGS. 4, 5 and 6, but in this last cutter of FIG. 7 there is a difference in that there is a strip of paper waste 103 which must be discarded.

Basically the machine of this invention is a paper folder as described and shown in FIGS. 1, 2, and 3 of the drawings. However, with certain modifications consisting primarily of adding cutting means as shown in FIGS. 4, 5, 6, and 7 the machine may be used to position one strip of paper separate and apart from another strip of paper directly on top of one another.

I am aware that numerous details of construction may be varied throughout a wide range without departing from the principles shown herein and I do not pro-

pose limiting the patent granted hereon otherwise than as necessitated by the appended claims.

What is claimed is:

1. The combination of a paper folder and slitter for the printing industry comprising a substantially horizontal flat plate having a forward end and an opposite rearward end, means at said forward end of said plate supplying a strip of paper along a fixed path to the underside of said plate, cooperative feed rolls at the rearward end of said plate arranged and constructed to pull said strip of paper past said plate, means folding said strip of paper around a side folding edge extending between said forward and rearward ends of said plate, said strip of paper having one side edge thereof extending outwardly past the side folding edge of said plate, said means folding said strip of paper including a small diameter paper pressing roller, said side folding edge of the plate in combination with the small diameter paper pressing roller causing said outwardly extending side edge of the paper to be folded over the folding edge and pressed down on the top side of said plate and de-

fining overlapped layers of paper, means transversely adjusting said plate relative to said fixed path to cause a greater or lesser degree of paper extension for fold over of the paper strip along the folding edge of the plate, a stationary elongated slitting knife, means mounting said stationary slitting knife transversely of said path on said plate and projecting outwardly beyond the folding edge of the plate at a location on said plate following said means folding the strip of paper, said slitting knife entering between the overlapped layers of paper and acting to slit said paper along the fold line as cooperative feed rolls pull the paper strip past said plate whereby the paper discharged from the cooperative feed rolls is in separate sheets one on top of the other.

2. A device as set forth in claim 1 in which said means mounting said stationary slitting knife includes an adjustable means to permit various degrees of projecting of said slitting knife beyond the folding edge of the plate.

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