May 26, 1970 W. C. HOFF 3,514,097

FOLDING APPARATUS FOR PAPER AND THE LIKE

Filed Nov. 13, 1967 2 Sheets-Sheet 1

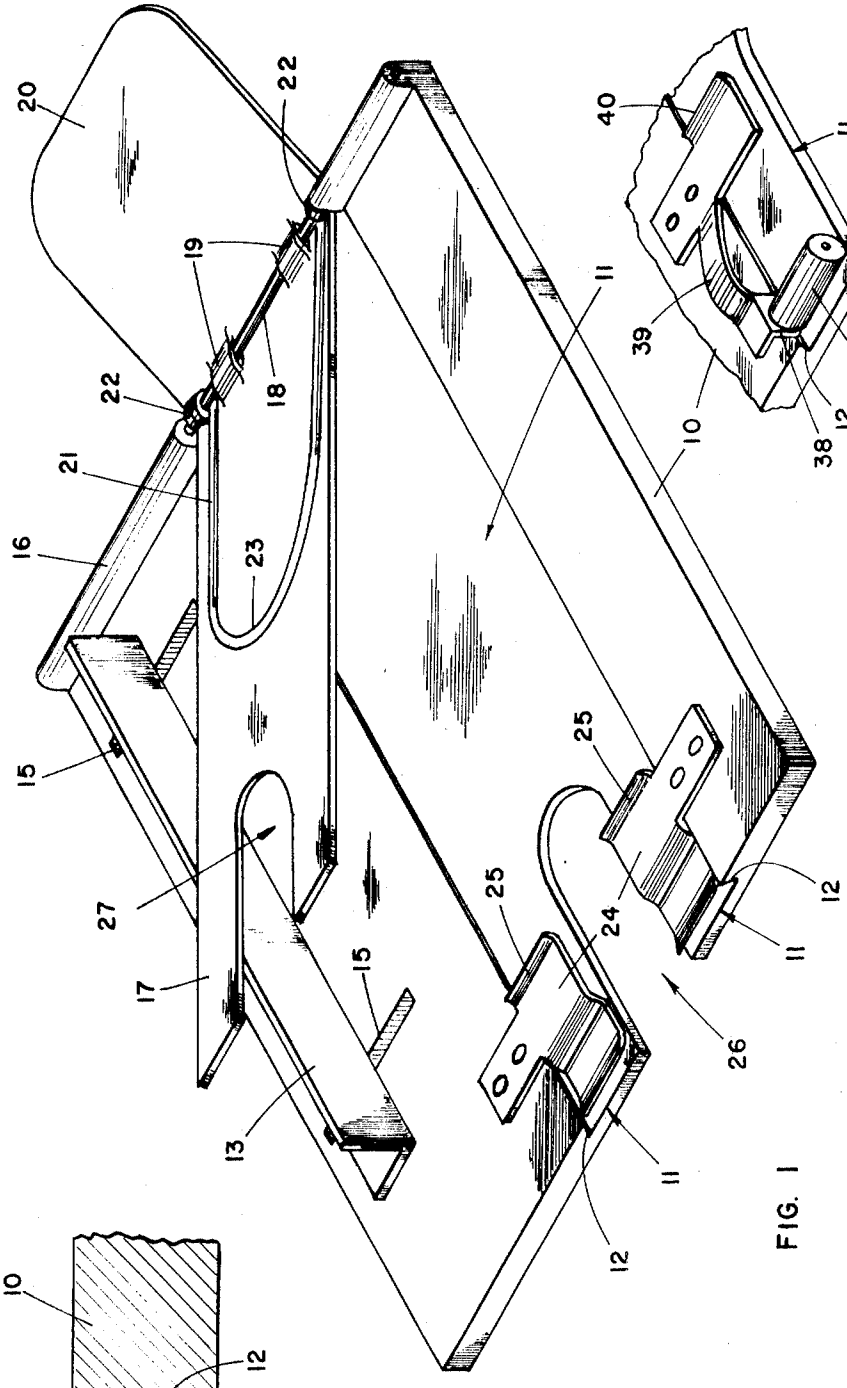


FIG. 1

FIG. 7

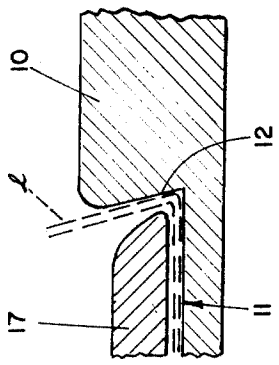


FIG. 2

INVENTOR
WALLY C. HOFF

BY George A. Rolston
ATTORNEY

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FOLDING APPARATUS FOR PAPER AND THE LIKE

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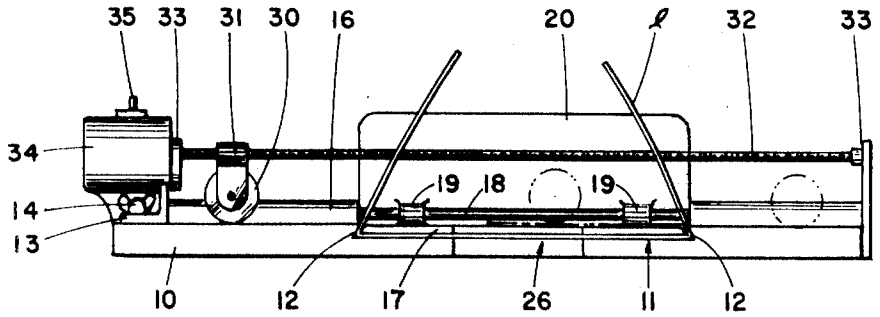


FIG. 6

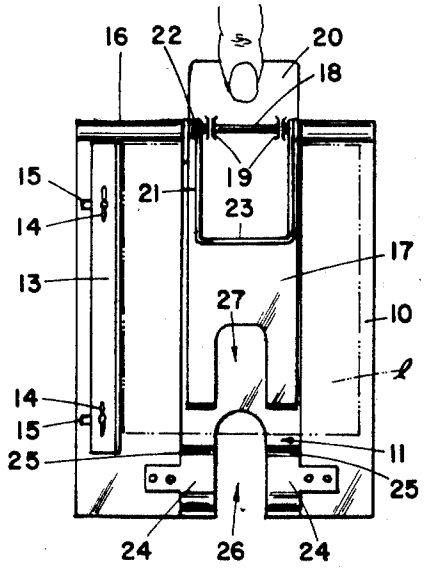


FIG. 3

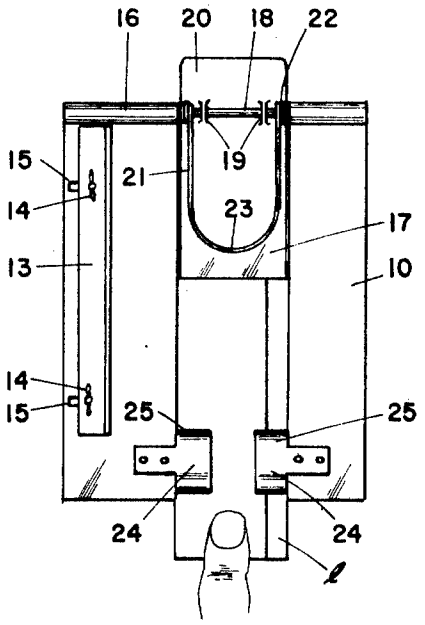


FIG. 5

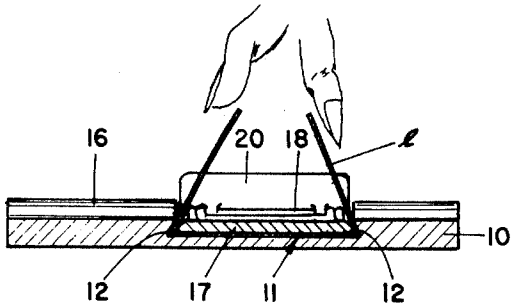


FIG. 4

INVENTOR
WALLY C. HOFF

BY George A. Rolston
ATTORNEY

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FOLDING APPARATUS FOR PAPER AND THE LIKE

Wally Charles Hoff, Toronto, Ontario, Canada, assignor to General Binding Corporation (Canada) Limited, a corporation of Canada

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Int. Cl. B65h 45/04
U.S. Cl. 270—61 8 Claims

ABSTRACT OF THE DISCLOSURE

This specification discloses a piece of apparatus suitable for a small or medium size office for use by untrained secretarial staff for folding mail and other pieces of paper and such sheet material. The apparatus includes a recessed die into which the paper is forced by a mandrel, thereby creasing the paper along either side of the mandrel. In a second operation, these creases are flattened and the piece of folded paper is removed.

This invention relates to apparatus for folding paper such as correspondence and the like.

Apparatus of this general type, usually known as "mail folders," has been under development for many years for use in the handling of bulk correspondence, usually by agencies specializing in the business of preparing and mailing correspondence for others. Obviously, in view of the very large volumes of correspondence handled by such specialized businesses, the letter folding machines developed by them have generally been developed to high degree of sophistication and capable of high speed continuous operation whereby to reduce the amount of handling of such correspondence to a minimum.

However, such sophisticated machines represent a very substantial capital investment, and are very seldom found in offices and small businesses, since the volume of correspondence handled, generally speaking, does not warrant such an expense. As a result, the great majority of business correspondence is folded entirely by hand. Hand folding of letters is undesirable from various points of view. For example, letters are often folded erratically or incorrectly and arrive at their destination looking crumpled and present a poor impression. In addition, such incorrect folding can sometimes lead to tearing of the letters when the envelopes are opened at their destination. Another disadvantage stems from the use of ballpoint pens in which the supply of ink is often excessive, and takes a considerable length of time to dry. When letters signed with such a ballpoint pen are folded by hand, the signature becomes smudged and may mark the correspondence or other material folded with the letter.

The present invention is therefore directed to providing a letter folding machine which is directed specifically to the hitherto untapped market provided by a large number of offices and small businesses where mail is daily folded by hand.

It is the objective of the invention to provide a letter folding apparatus which is small and compact and may lie on a desk without obstruction to the normal use of the desk, and which involves a minimum of moving parts and is simple to operate by secretarial personnel without any special mechanical knowledge or training.

More particularly it is an objective of the present invention to provide a letter folding machine having the foregoing advantages in which a substantial portion of the machine may be molded in one piece from plastic, thereby reducing the cost.

More particularly, it is an objective of the present invention to provide a letter folding machine having the

foregoing advantages in which the letter is folded in a die of predetermined dimensions, the location of the folds in the letter being adjustable by means of a stop adjacent to one side of the die thereby ensuring the provision of precisely regulated fold lines in the letter.

More particularly, it is an objective of the present invention to provide a letter folding machine having the foregoing advantages which is substantially unbreakable and in which no service is required.

The foregoing and other advantages will become apparent from the following description of a preferred embodiment of the invention which is hereinafter described, by way of example only, with reference to the following drawings in which like reference devices refer to like parts thereof throughout the various views and diagrams and in which;

FIG. 1 is a perspective illustration of a folding apparatus according to the invention;

FIG. 2 is a greatly enlarged sectional illustration of a detail of the apparatus shown in FIG. 1, along the line 2—2;

FIG. 3 is top plan view of the apparatus shown in FIG. 1 illustrating the first step of the operation thereof;

FIG. 4 is an end elevational view of the apparatus shown in FIG. 1 and FIG. 3 at a second stage in the operation;

FIG. 5 is a top plan view, similar to that of FIG. 3, showing the third and final stage of the operation;

FIG. 6 is an end elevational view of a further embodiment of the apparatus, and,

FIG. 7 is a perspective illustration of a detail of the apparatus showing a further embodiment.

Referring now to FIGS. 1 to 5, it will be seen that this preferred embodiment of the mail folder according to the invention comprises a one-piece unitary base indicated generally as **10** formed of moulded plastic, and having a recessed, folding die **11** formed therein of predetermined width, being defined by tapering side walls **12**, which diverge towards the bottom of die **11** thereby providing a mouth or opening thereof of reduced size. A moveable register bar **13** is located on one side of base **10** being adjustably secured, as by wing nuts **14** in variable locations, base **10** being slotted as at **15** for the purpose. A fixed register member **16** is moulded on base **10** along another side thereof normal to register bar **13**.

A letter folding mandrel plate **17** is formed of stainless steel or heavily plated steel to permit easy sliding of paper thereon and is dimensioned to fit within die **11** at its smallest point, namely its upper portion. Mandrel plate **17** is hingedly mounted on base **10** by means of rod **18** passing through struck out portions **19** of plate **17** and seated at each end in recesses in register member **16**.

Mandrel plate **17** incorporates an integral handle **20** extending to one side of base **10** upwardly at an angle of about 45°, for raising plate **17**. A spring **21** having free ends **22** engaging base **10** and a pressure arm **23** overlying plate **17** provides downward spring pressure on plate **17** to force the same into die **11**.

In order to flatten the creases formed in a letter or piece of paper, indicated as **1**, a pair of creasing clips **24** are attached at the end of die **11**, on base **10** remote from register member **16**. Clips **24** are biased downwardly to press against the lower surface of die **11**, and incorporate upwardly angled deflector guides **25** to guide the loosely creased paper **1** into clips **24**. U-shaped finger and thumb openings **26** and **27** are cut out of base **10** and plate **17** in registration with one another to permit the folded letter or piece of paper **1** to be grasped with finger and thumb and be drawn endwise off mandrel plate **17** between clips **24**.

In operation, mandrel plate **17** is raised by pressing handle **20** downwardly and slipping the piece of paper **1** between plate **17** and base **10**, being sure that two side edges of paper **1** register, one with fixed register member **16** and the other with moveable register bar **13**. It will be appreciated that moveable register bar **13** has been adjusted by trial and error so as to locate the piece of paper **1** in the correct position in which it is desired to form the final folds. Handle **20** is then released and pressure on **23** of spring **21** forces mandrel plate **17** downwardly into die **11**. Such downward pressure pinches paper **1** into loose creases along either side of plate **17**, and the tapering side walls **12** of die **11** cause paper **1** to fold inwardly over mandrel **17**. In order to increase this inward folding effect, it is to be noted that die **11** is somewhat deeper than the thickness of mandrel **17**, preferably being of a depth approximately twice such thickness. The two upstanding ends of paper **1** are then folded inwardly over mandrel **17** by hand and almost simultaneously the finger and thumb can take hold of the three layers of paper at the free end of mandrel **17** and draw the same endwise off mandrel **17** between clips **24**. Deflector guides **25** of clips **24** will cause the loosely folded portions of paper **1** to enter clips **24** without distorting the same, and clips **24** will flatten the creases formed in paper **1**. The folded piece of mail can then be inserted into an envelope as a subsequent operation.

According to a further embodiment of the invention, illustrated in FIG. 6, provision may be made for automatic or semi-automatic operation. Thus the intermediate step, described above, manually infolding the two free ends of paper **1** over mandrel **17** may in fact be performed by means such as a mobile roller **30**, arranged on yoke **31** which is internally threaded and driven by an archimedes screw **32** mounted for rotation between plates **33**. An electric motor **34** will rotate screw **32** and cause yoke **31** to travel to and fro across base **10**. In such to and fro movement, roller **30** will catch first one portion and then the other of paper **1** and flatten the same against mandrel **17**. Any suitable switch means **35** can be provided for operating motor **34** when, mandrel **17** is seated in die **11**. Obviously, this arrangement may be improved in many ways, this being merely illustrative of a crude form of automatic means for performing this operation.

The operation of roller **30** could thus be effected more quickly by a continuous belt and a motor driving the same through a clutch and reversing mechanism.

According to a further embodiment illustrated in FIG. 7, clips **24** for flattening the creases may be replaced by rollers **37** mounted for rotation on brackets **38** formed integrally with spring arms **39** curved to provide a spring biasing action pressing rollers **37** firmly downwardly onto the bottom of die **11**. Guide members **40** are formed integrally with spring arms for guiding paper **1** into rollers **37**.

The foregoing description of a preferred embodiment of the invention is given here by way of example only. It is not intended that the invention shall be deemed limited to any of the specific features described, but comprehends all such variations thereof as come within the spirit and scope of the appended claims.

What I claim is:

1. Apparatus for folding sheets of paper and the like said apparatus comprising;

a flat planar base member;

a recessed paper folding die formed as a depression of predetermined width defined by two spaced side walls in said base member below the plane of said base member, said width corresponding to the width of the sheet when folded and being open at one end for endwise removal of said folded sheet;

register means on at least two sides of said base member for locating a sheet of paper or the like in predetermined relation to said die;

mandrel means of generally flat planar construction swingably mounted at one end on one side of said base member for movement into and out of said die, the other end being free to permit removal of a folded sheet of paper therefrom for forcing a portion of a sheet of paper into said die and creasing the same around said mandrel means, said mandrel being dimensioned to fit loosely within said die extending from side to side thereof between said side walls below the plane of said bases member, and,

means mounted on and contacting said base member for flattening said creases in said paper.

2. Apparatus as claimed in claim **1** wherein said recessed die is defined by angled side walls diverging towards the interior of said die.

3. Apparatus as claimed in claim **1** wherein one of said register members at least is moveable and including adjustable fastening means for said moveable register member for fastening the same in adjustable locations with respect to said base.

4. Apparatus as claimed in claim **1** including handle means integral with said mandrel, for movement of said mandrel away from said die and spring means normally urging said mandrel into said die.

5. Apparatus as claimed in claim **1** wherein said flattening means comprises spring loaded pressure means at said open end of said die on either side thereof, and guide means associated therewith for guiding said creased paper into said pressure means, as said paper is removed from said die through said open end thereof.

6. Apparatus as claimed in claim **1** including hinge means for swingably mounting said mandrel on one side of said base, at one end of said die, for swinging movement into and out of said die, handle means integral with said mandrel for causing swinging out of said die, and spring means associated with said mandrel normally urging the same into said die, and spring loaded pressure means at the other end of said die on either side thereof, and guide means associated with said pressure means for guiding said creased paper into said pressure means as the same is withdrawn from said die.

7. Apparatus as claimed in claim **1** wherein said mandrel is of a predetermined thickness, and said die is recessed in said base to a depth of about twice said mandrel thickness.

8. Apparatus as claimed in claim **1** including roller means movably mounted on said base member to move from side to side of said base member over said mandrel when the same is in position in said die to flatten said paper against said mandrel, and drive means including an electric motor for driving said roller means to move to and fro.

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LAWRENCE CHARLES, Primary Examiner

U.S. Cl. X.R.

270—86