July 9, 1968 W. F. KOHLMEYER 3,391,923

PAPER FOLDING APPARATUS

Filed Nov. 19, 1965

Fig. 1

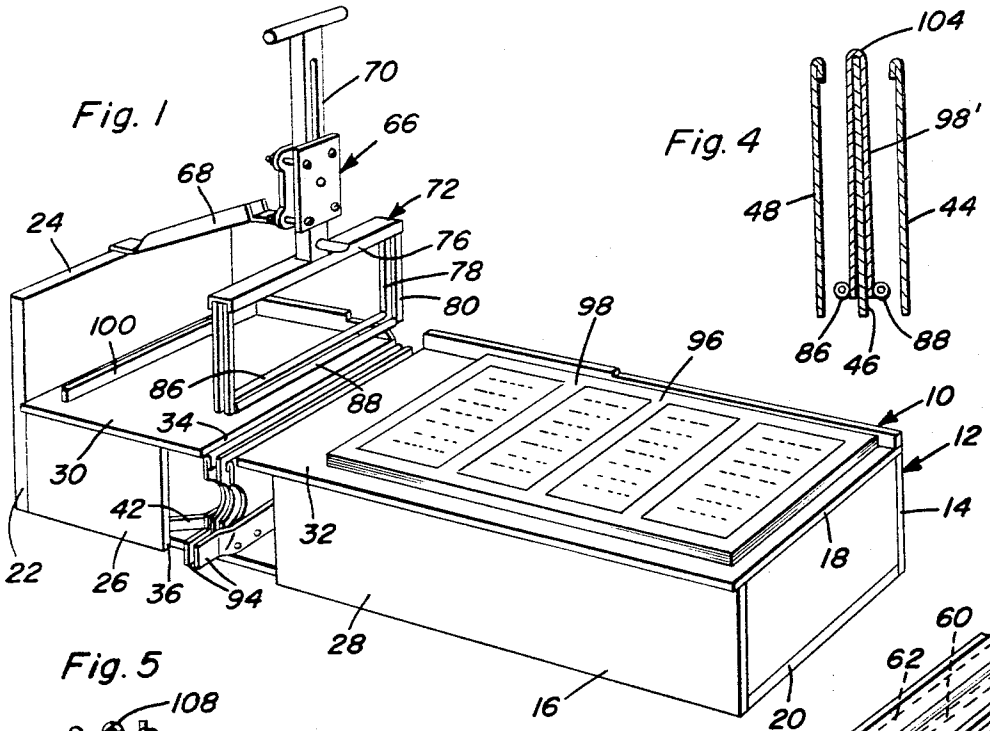


Fig. 4

Fig. 5

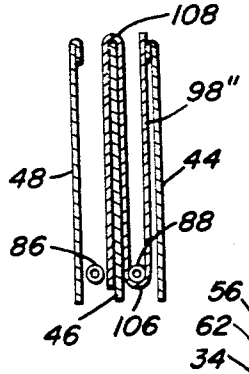
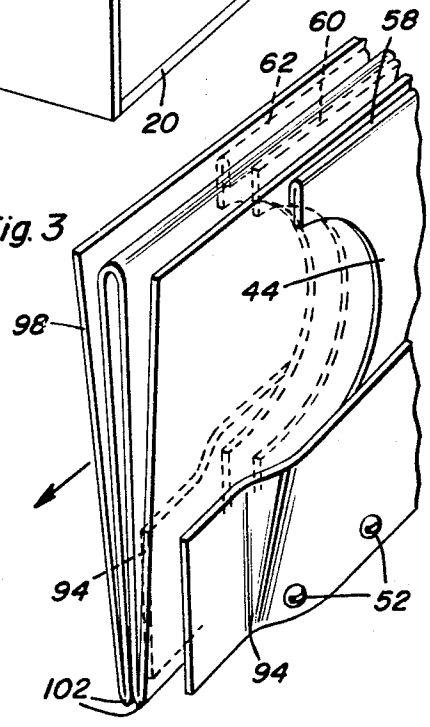


Fig. 2

Fig. 3



Wilbur F. Kohlmeyer

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

United States Patent Office 3,391,923 Patented July 9, 1968

3,391,923

PAPER FOLDING APPARATUS

Wilbur F. Kohlmeyer, % Portable Cab Co., E. 7th on U.S. Highway 36, Washington, Kans. 66968

Filed Nov. 19, 1965, Ser. No. 508,743
7 Claims. (Cl. 270—84)

ABSTRACT OF THE DISCLOSURE

An apparatus defining a generally planar support surface having a narrow slot formed therein and including an elongated narrow abutment member disposed generally planar with the abutment surface and centrally intermediate the opposite sides of the slot with a pair of parallel relatively stationary and journalled rollers disposed outwardly of the abutment surface and mounted for movement into the slot on opposite sides of the abutment member whereby to simultaneously form three folds in a sheet of paper disposed on the support surface overlying the slot upon movement of the rollers toward the support surface and into the slot.

This invention relates to a novel and useful paper folding apparatus and more specifically to a device adapted to be utilized primarily for the purpose of folding sheets of paper such as letter paper prior to insertion of the sheet paper into envelopes.

The paper folding apparatus of the instant invention includes a supporting surface upon which a stack of sheets of paper to be folded may be placed and the supporting surface is provided with a slot or opening extending thereacross down through which the sheets of paper to be folded may be displaced. The apparatus includes three first elongated generally parallel and spaced apart side-by-side abutment surfaces disposed in the aforementioned slot and facing upwardly. The apparatus additionally includes two second elongated side-by-side abutment surfaces facing downwardly and in vertical alignment with the slot and movable from a position disposed above the plane of the supporting surface to a second position spaced appreciably below the supporting surface upon movement through the slot with the downwardly facing abutment surfaces passing between the two upwardly facing abutment surfaces spaced farthest apart and on opposite sides of the center upwardly facing abutment surface.

With this construction, a sheet of paper to be folded may be disposed on a supporting surface with the sheet of paper extending across the slot. Then, the two downwardly facing abutment surfaces may be moved downwardly toward the plane in which the supporting surface is disposed into engagement with the sheet of paper to be folded. Further downward movement of the downwardly facing abutment surfaces will of course cause the portion of the sheet of paper disposed immediately above the center upwardly facing abutment surface to be folded thereover and the portions of the sheet of paper disposed beneath the downwardly facing abutment surfaces to be folded thereunder. By properly positioning the paper to be folded in a direction extending transversely of the slot, the paper to be folded may have either one, two or three folds formed therein as will be herinafter more fully set forth.

The main object of this invention is to provide a novel and useful paper folding apparatus.

Another object of this invention is to provide a paper folding apparatus constructed in a manner so as to be selectively utilized to form either one, two or three folds in a sheet of paper to be folded.

Yet another object of this invention is to provide a paper folding apparatus constructed in a manner whereby

it may be readily transported from one location to another.

Another object of this invention is to provide a paper folding apparatus which is readily adapted to fold sheets of paper of various sizes.

A further object of this invention is to provide a paper folding apparatus in accordance with the preceding objects and including means whereby at least some of the lines along which folds are formed in a sheet of paper by the apparatus may be sharply creased upon withdrawal of the folded paper from the apparatus.

A final object of this invention to be specifically enumerated herein is to provide a paper folding apparatus in accordance with the preceding objects which will conform to conventional forms of manufacture, be of simple construction and easy to use so as to provide a device that will be economically feasible, long lasting and relatively trouble-free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view of the paper folding apparatus of the instant invention;

FIGURE 2 is an enlarged fragmentary longitudinal vertical sectional view taken substantially upon a plane passing through the paper folding apparatus in the area of the transverse slot or opening formed in the paper supporting surface of the apparatus and with the movable abutment surfaces shown in lowered positions in solid lines and in raised positions in phantom lines;

FIGURE 3 is a fragmentary enlarged perspective view of the portion of the paper folding apparatus which is adapted to sharply crease at least some of the folds formed in a sheet of paper by the apparatus; and

FIGURES 4 and 5 are diagrammatical views illustrating two additional folds which may be formed in a sheet of paper other than the folds illustrated in FIGURE 2.

Referring now more specifically to the drawings, the numeral **10** generally designates the paper folding apparatus of the instant invention. The apparatus **10** includes a housing generally referred to by the reference numeral **12** having opposite side walls **14** and **16** interconnected at their upper marginal edge portions by means of a top wall **18** and along their lower marginal edge portions by means of a bottom wall **20**. One end of the housing **12** includes an end wall **22** secured between the corresponding end edges of the walls **14**, **16**, **18** and **20** and the end wall **22** includes an extension **24** defining an abutment surface which projects upwardly above the adjacent end of the top wall **18**.

The side walls **14** and **16** each comprise a pair of longitudinally spaced wall sections **26** and **28** and the top wall **18** comprises a pair of longitudinally spaced sections **30** and **32** including upper supporting surfaces. The spacing between the sections **30** and **32** defines a slot **34** and a slot **36** is defined between each pair of adjacent ends of the sections **26** and **28**.

A lower assembly generally referred to by the reference numeral **40** is secured within the housing **12** in alignment with the slots **34** and **36** by means of suitable brackets **42** secured between the sections **26** and the assembly **40**. The lower assembly **40** includes three upstanding plates **44**, **46** and **48** which generally parallel each other and are secured together as a unit forming the assembly **40** by means of spacer blocks **50** secured between the plates **44** and **48** and the plate **46** by means of a suitable fastener **52**. In addition, a pair of stiffening plates **54** are secured to the remote surfaces of the plates **44** and **48** by means of the fastener **52**.

The upper ends of the plates **44** and **48** are bent backward upon themselves as at **56** and the upper ends of the plates **44**, **46** and **48** define elongated generally parallel abutment surfaces **58**, **60** and **62**. The abutment surfaces **58** and **62** are of course rounded and thus adapted to have paper slide thereover more easily than the abutment surface **60** which includes sharper opposite side marginal edge portions inasmuch as the upper end of the plate **46** is not bent downwardly upon itself. The surfaces **58**, **60** and **62** are disposed in generally the same horizontal plane spaced slightly below the horizontal plane containing the upper surface **64** of the top wall **18**.

A slide support assembly generally referred to by the reference numeral **66** is provided and is supported from the extension **24** by means of an arm type bracket **68** extending and secured between the slide support assembly **66** and the extension **24** in any convenient manner. In addition, any suitable means may be utilized to support the slide support assembly **66** from the housing **12**.

An elongated slotted handle **70** of an upper assembly generally referred to by the reference numeral **72** is slidingly supported from the slide assembly **66** for longitudinal reciprocation in a vertical plane and the lower end of the handle **70** includes a crosshead **76** from which two bail-shaped members **78** and **80** are supported. The bail-shaped members **78** and **80** include lower rod-like bight portions **82** and **84** on which rollers **86** and **88**, respectively, are journaled, the rollers **86** and **88** defining downwardly facing second elongated abutment surfaces.

From FIGURES 1 and 3 of the drawings, it may be seen that at least one corresponding pair of the ends of the stiffening plates **54** include convergent abutment surface defining extensions **94** which project outwardly beyond the corresponding ends of the plates **44**, **46** and **48** and are in horizontal registry with the lower ends of the rollers **86** and **88** when the latter are disposed in their lowermost positions illustrated in FIGURE 2 of the drawings. The extensions **94** include free end portions which are spaced slightly apart and adapted to receive therebetween the lower folds formed in a sheet of paper for the purpose of sharply creasing these folds as the sheet of paper is withdrawn from the apparatus **10** through the corresponding slot **36**.

In operation, a stack **96** of individual sheets **98** to be folded may be placed upon the section **32**. Then, with the upper assembly **72** in its upper position illustrated in FIGURE 1 of the drawings, the uppermost sheet **98** may be moved toward the extension **24** and abutted against the transverse abutment member **100** secured to the end portion of the section **30** adjacent the extension **24**. This of course will position such a single sheet **98** above the slot **34** with the latter substantially registered with the center of the sheet **98**. Then, the upper assembly **72** may be lowered to move the rollers **86** and **88** into contact with the sheet **98** so that the rollers may urge the portions of the sheet **98** engaged thereby downwardly along opposite sides of the center plate **46**. Inasmuch as the sheet **98** has its approximate centerline engaged with the surface **60** and the sharp opposite marginal edges of the surface **60** will prevent longitudinal shifting of the sheet **98** relative to the plate **46**, the sheet **98** will be evenly folded in three places so as to form a four section accordion-type fold. After the rollers **86**. **88** have been moved to the lowermost positions illustrated in FIGURE 2 of the drawings, the handle **70** may be raised to withdraw the upper assembly **72** from between the plates **44** and **48**. Then, the folded sheet **98** may be withdrawn from the apparatus **10** between the convergent extensions **94** in order that the folds formed in the sheet **98** and previously passing about the rollers **86** and **88** may be sharply creased as at **102** as a result of being drawn between the extensions **94**.

With attention now invited to FIGURE 4 of the drawings, it may be seen that a sheet **98'** half the length of the sheet **98** may be positioned with its approximate center above the abutment surface **60** and folded into a two-section folded sheet by forming a single fold **104** in the sheet **98'**. On the other hand, with attention now directed more specifically to FIGURE 5 of the drawings, it may seen that a sheet **98''** three-quarters the length of the sheet **98** may be folded by the apparatus **10** in a manner so as to provide a three-section accordion folded sheet by forming only two folds **106** and **108** therein.

The rollers **86** and **88** are of course utilized in lieu of rigid members so as to enable the abutment surfaces defined by the lower peripheral portions of the rollers **86** and **88** to move across the surface of the sheet **98** being folded with less resistance. Additionally, the rounded abutment surfaces **62** and **58** of the plates **48** and **44** also tend to reduce the sliding friction between the sheet **98** and the plates **44** and **48**. Therefore, only the abutment surface **60** frictionally grips the sheet **98** so as to act as a means to prevent shifting of the sheet **98** being folded relative to the abutment surface **60**.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A paper folding apparatus including a pair of generally coplanar upwardly facing and stationary supporting surfaces including spaced apart and generally parallel adjacent edge portions and adapted to support a flexible panel disposed thereover and bridging the spacing between said edge portions with said panel disposed in generally planar condition, a narrow, elongated, and stationary upwardly facing abutment surface generally paralleling and coplanar with said pair of supporting surfaces and spaced generally centrally therebetween, two elongated abutment members mounted for simultaneous movement along paths disposed generally normal to the plane of said surfaces and extending through the spaces disposed on either side of said narrow surface and between said pairs of supporting surfaces between first positions spaced from and facing one side of said plane and second positions shifted through and disposed on the other side of said plane, said abutment members comprising elongated rollers journaled for rotation about axes generally paralleling said edge portions and stationarily positioned relative to each other.

2. The combination of claim **1** wherein said abutment surface comprises one edge portion of a first stationary plate disposed generally normal to said plane, a further pair of plates generally paralleling and spaced to opposite sides of said first plate and between which said paths extend, the edge portions of said further plates corresponding to said one edge portion of said first plate being free of portions thereof disposed on said one side of said plane.

3. The combination of claim **2** wherein said apparatus includes means defining a pair of abutment surface defining members disposed outwardly of one set of corresponding ends of said rollers when the latter are disposed in said second positions and including portions operative to sharply crease the folds formed in a sheet of paper folded by said rollers as said sheet is withdrawn from between said rollers along a path generally paralleling the rollers.

4. The combination of claim **1** wherein said apparatus includes means defining a pair of stationary abutment surnarrow abutment surface, disposed to one side of and facing toward said paths, and positioned relative to said plane so as to be engageable by one edge portion of a sheet of paper disposed on said supporting surfaces and moved thereacross from said paths toward said abutment surface means to properly position said paper for folding by said apparatus.

5. The combination of claim **1** wherein said apparatus includes means defining a pair of stationary abutment sur-

face defining members disposed outwardly of one set of corresponding ends of said rollers when the latter are disposed in said second positions and including portions divergent toward said one set of corresponding ends and operative to sharply crease a sheet of paper folded by said apparatus along the adjacent fold lines formed in said sheet as the later is withdrawn from between said rollers along a path generally paralleling the rollers.

6. The combination of claim 5 wherein said divergent portions embracingly receive the adjacent edge portions of said pair of plates therebetween.

7. The combination of claim 1 wherein said apparatus includes means defining a pair of abutment surface defining members disposed outwardly of one set of corresponding ends of said rollers when the latter are disposed in said

second positions and including portions operative to sharply crease the folds formed in a sheet of paper folded by said rollers as said sheet is withdrawn from between said rollers along a path generally paralleling the rollers.

References Cited

UNITED STATES PATENTS

1,088,456	2/1914	Schefer	270—61
2,699,936	1/1955	Dixon et al.	270—84
2,918,276	12/1959	Weston	270—61
3,241,829	3/1966	Acher	270—84 X

EUGENE R. CAPOZIO, *Primary Examiner.*

P. V. WILLIAMS, *Assistant Examiner.*