Sept. 9, 1969 J. H. KWIK, JR 3,466,027

PAPER FOLDING MACHINE

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FIG. 1

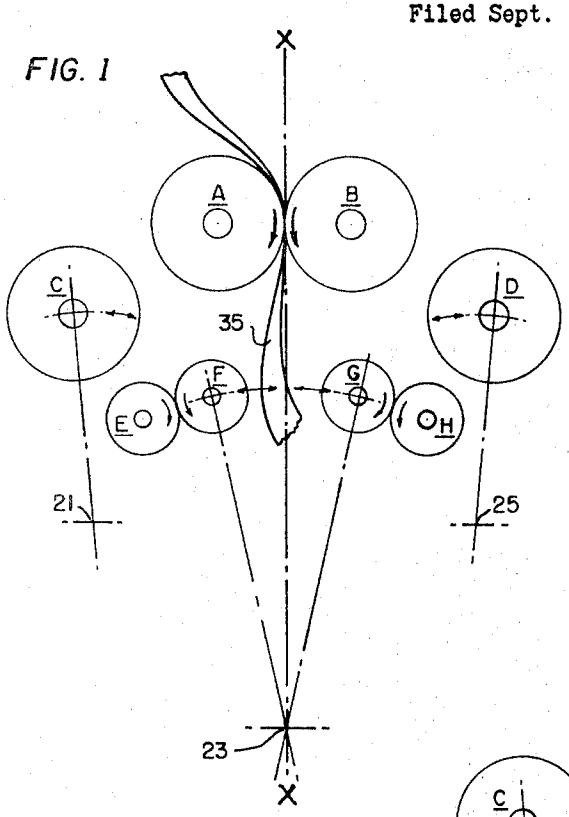


FIG. 2

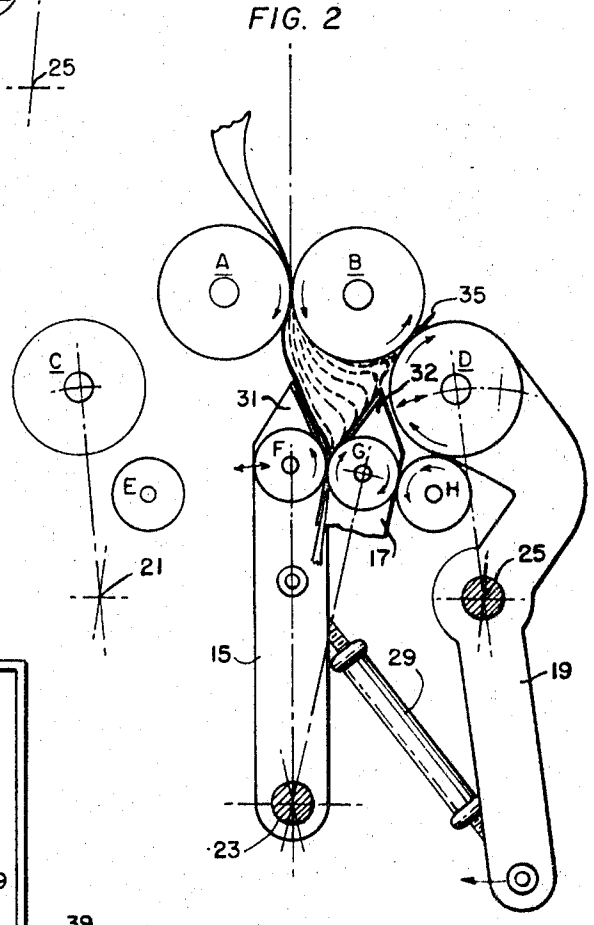
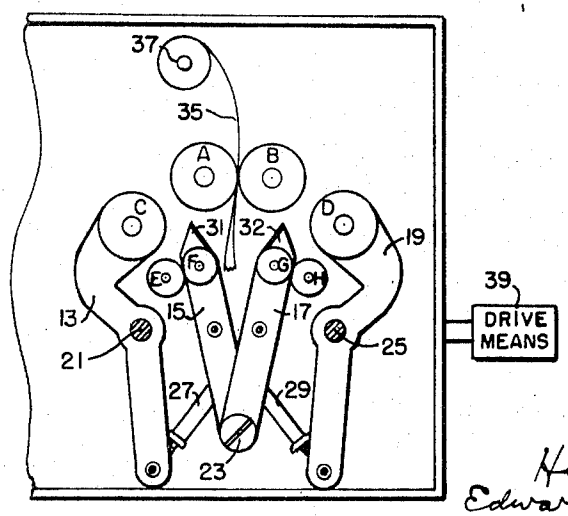


FIG. 3



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PAPER FOLDING MACHINE

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ABSTRACT OF THE DISCLOSURE

The paper folding and creasing machine of the present disclosure includes essentially a combination of four fixed and four shiftable rollers that operate in timed, sequential arrangement whereby in any one operational direction six of the rollers are active to fold and crease the paper as desired. The machine further includes pivotable links between several of said rollers to effect movement and displacement of the shiftable rollers.

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to me of any royalty thereon.

Background of the invention

The present invention relates to a machine for the folding and creasing of paper. Specifically the machine is devised for fan-folding paper and to incorporate a fixed crease therein whereby the paper so formed can be readily stacked and/or stored.

The invention herein has particular application in the fan-folding and creasing of paper fed from a roller upon which such paper has been placed after certain informational data has been printed on the paper. When in such condition, the roll must be unrolled to secure specific information on a particular portion of the paper. Obviously such means is cumbersome and time consuming. On the other hand, specific positions or locations of paper fan-folded can be readily ascertained.

Summary of the invention

The present invention contemplates a machine for creasing and fan-folding paper that is fed from a reel, or similar device, into the machine. The machine is one that is readily adaptable to fan-fold paper of widths up to 16 inches; is one that is simple in structure and sturdy in construction.

Brief description of the drawings

The invention will be fully apparent from the following description when taken in connection with the annexed drawings, in which:

FIG. 1 is a schematic view showing the arrangement of the several rollers at its initial and intermediate stages of operation;

FIG. 2 is a schematic view showing the arrangement of the rollers during their shifted position, and when creasing and folding of the paper is being accomplished; and

FIG. 3 is an end view of the rollers, and the link arrangement between the several rollers to effect their shifting.

Description of the preferred embodiment

For convenience in the description of the system and arrangement of rollers, and for a better understanding of their operation, a line X—X has been drawn to indicate an axis of symmetry so that an array of rollers on one side of the line is a mirror image of the other. The entire system of rollers is contained in a framework

which may also include the varied mechanical and electrical timing mechanisms that serve to sequentially drive or actuate the rollers as hereinafter described. Such mechanisms are conventional and known to those skilled in the art are omitted from the drawings, other than by a box representation.

All of the rollers of the system are axially and longitudinally mounted and extend to substantially the full length of the framework and are journalled in the conventional manner. The rollers are so aligned that their elongated axes are parallel to each other at all times.

The location of the several rollers of the system will be described by reference to FIG. 1 which portrays the rollers in their inoperative position, and also at their intermediate arrangement, i.e., their position between the opposing creasing and fan-folding stages.

Referring to FIG. 1 there are shown rollers A and B which are positioned close to the top portion of the frame work and may be designated as the lead rollers, that is they serve as a means for introducing or leading the paper from the roll into the system of rollers. As seen in FIG. 1, roller A is located to the left of the center line X—X, while roller B is to the right of the line X—X. The rollers A and B whose axes are in fixed parallel arrangement are in abutment and in frictional engagement and made of a slightly resilient material such as rubber so as to permit a thickness of one sheet of paper to be passed between the rollers when said rollers are rotating. Slightly below roller A and to the left thereof is roller C, and similarly to the right and slightly below roller B is a roller D. In their location as shown in FIG. 1, it is apparent that rollers C and D are so aligned that a line between their longitudinal axes would be perpendicular to the line X—X. All of the rollers A, B, C, and D are of the same diameter. Located below the rollers A and C and to the left of the line X—X, and to the right of roller C, are abutting rollers E and F with roller E slightly below and to the left of roller F. Similarly below rollers B and D and to the right of the line X—X, and to the left of roller D, are abutting rollers G and H with roller H slightly below and to the right of roller G.

Of all eight rollers heretofore described, only one, i.e., roller A is a driving roller while the remainder of the rollers B–H are driven by frictional engagement as hereinafter described. The lead rollers A and B as well as rollers E and H are fixed, that is, secured within the framework in their locations as shown in FIG. 1. In contradistinction thereto, the rollers C, D, F and G are capable of being arcuately shifted from their locations such as shown in FIG. 1 to different locations such as shown in FIG. 2. In FIG. 2 it can be seen that roller F has been shifted to the right into frictional engagement with roller G and roller D has been shifted to the left into frictional engagement with fixed rollers B and H and intermediate said rollers. By this arrangement it can be seen that rollers A, B, D, H, G and F are in frictional and driven engagement to perform what may be termed the right side crease and fold of the paper. Though not shown in the drawings rollers C, F and G can be similarly shifted so as to bring into frictional and driven engagement the rollers A, B, C, E, F and G to perform a left side crease and fold.

The means for effecting the movement and shifting of the rollers C, D, F and G to the locations indicated above is shown in FIG. 3. Such means include a series of pivotal links or arms **13**, **15**, **17**, **19**, **27** and **29** arranged in the following manner. Link **13** has one end terminate at roller C, and pivots at point **21**. Links **15** and **17** have one of their ends terminate respectively at rollers F and G and their other ends terminate at common pivot point **23**. Link **19** has one end terminate at

roller D and pivots at point **25**. Also included in the link arrangement shown are arm **27** that links arms **13** and **17**, and arm **29** that links arms **19** and **15**. FIG. 3 shows the complete linkage system which engages one end of the rollers identified. Another identical linkage system is provided for the other ends of the same rollers. Shown affixed to the upper ends of link **15** and link **17** are respective bars **31, 33** which extend the full length as the rollers. The bars terminate in a taper edge as shown. The paper to be creased and fan-folded is shown at **35** and unreels from a reel **37**.

In the operation of the device, a fan-fold of the paper **35** will be described in relation to the view shown in FIG. 2, i.e., a right side fold. The paper is initially drawn through rollers A and B for a predetermined distance, and momentarily thereafter the drive means **39** initiates movement of the arms **19** and **15** to the positions shown in FIG. 2. At the same time movement of the roller F, and the bar **31** will engage the paper **35** to divert its downward movement to force it between rollers B and D to effect a bend or fold in the paper. This will continue until the dual edge of the paper is slightly beyond the abutting surfaces of the rollers B and D to form a more permanent crease or fold in the paper. At that stage the driving mechanisms are actuated to return the rollers to their initial position as shown in FIG. 1. This will allow the folded paper to fall between the rollers to an appropriate container. The timing sequence is so arranged that at the time a length of paper is folded and falling downwardly, a fresh length of paper from the roll **37** has been drawn into the roller system ready to be folded, however, at this stage a left side fold is accomplished. The process is then repetitive.

What is claimed is:

1. A machine for creasing and fan-folding paper fed from a reel comprising

a framework,

a series of eight rotatable rollers (A–H) arranged about a plane of symmetry which includes first (A) and second (B) rollers in frictional engagement arranged respectively on either side of said plane and adjacent to the top of said framework adapted to draw the paper downwardly;

third (C) and fourth (D) rollers spaced from and below the respective first and second rollers and symmetrically arranged relative to said plane;

fifth (E) and seventh (F) rollers normally in abutment with each other spaced from and below said first and third rollers on one side of the plane of symmetry;

sixth (G) and eighth (H) rollers being a mirror image of said fifth and seventh rollers;

means for alternately shifting the fourth (D) roller into frictional engagement with said second (B) and eighth (H) rollers and intermediate therewith and for shifting said seventh (F) roller into frictional engagement with said sixth (G) roller;

and for shifting said third (C) roller into frictional engagement with said first (A) and fifth (E) rollers and intermediate therewith and for shifting said sixth (G) roller into frictional engagement with said seventh (F) roller;

means associated with at least one of said rollers for diverting said paper in its downward travel into pressing engagement between either said second (B) and fourth (D) rollers, or between said first (A) and third (C) rollers to effect a crease and fold in said paper.

2. A machine of the kind set forth in claim **1** wherein the means for shifting the several rollers consists of a plurality of pivotable arms, each of said arms having one of their ends in operable engagement with a respective roller and a link connecting the arm associated with said third roller to the arm associated with said sixth roller for mutual shifting of said third and sixth rollers, and a link connecting the arm associated with said fourth roller to the arm associated with said seventh roller for mutual shifting of said fourth and seventh rollers, and means for driving all of said arms.

3. A machine of the kind set forth in claim **2** wherein the arms associated with said sixth and seventh rollers have a common pivot point.

4. A machine of the kind set forth in claim **2** wherein the means for diverting said paper in its downward travel comprises an elongated bar operatively associated with at least one of said rollers and is coextensive with said roller.

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U.S. Cl. X.R.

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