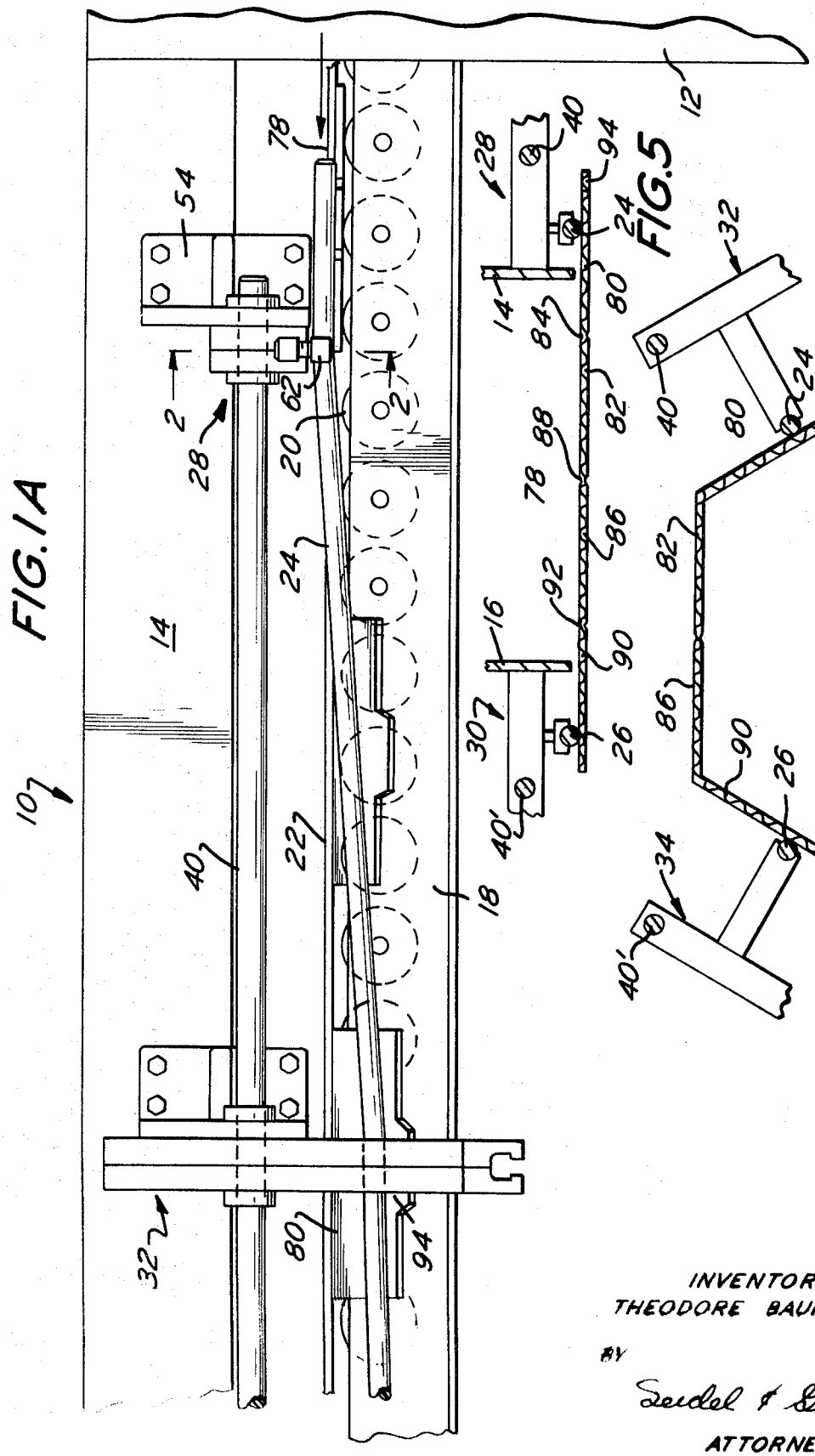
March 23, 1971 T. BAUM 3,572,221

BOX BLANK FOLDER

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BOX BLANK FOLDER

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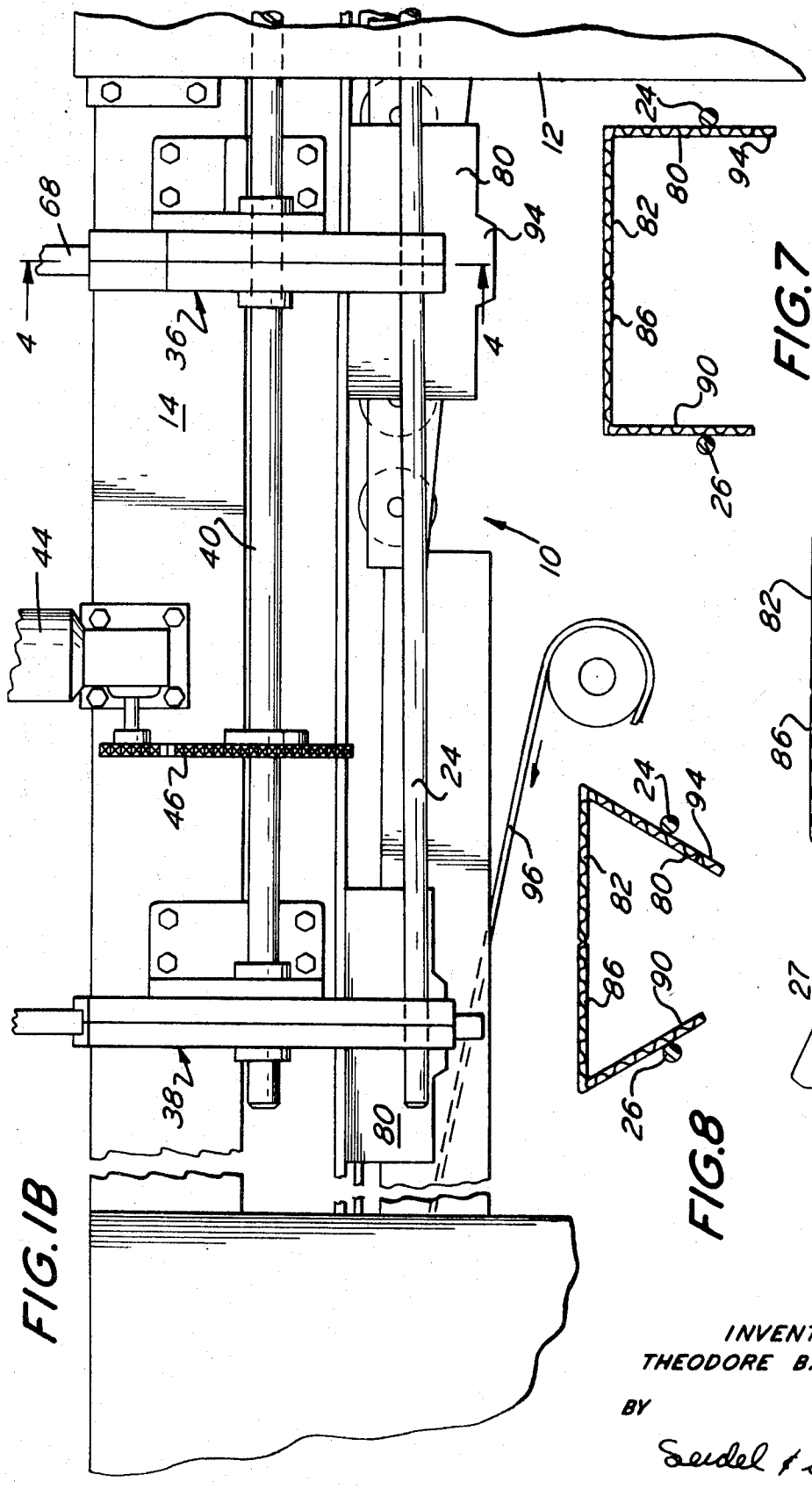



FIG. 1B

FIG. 7

FIG. 8

FIG. 9

FIG. 12

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BOX BLANK FOLDER

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FIG.2

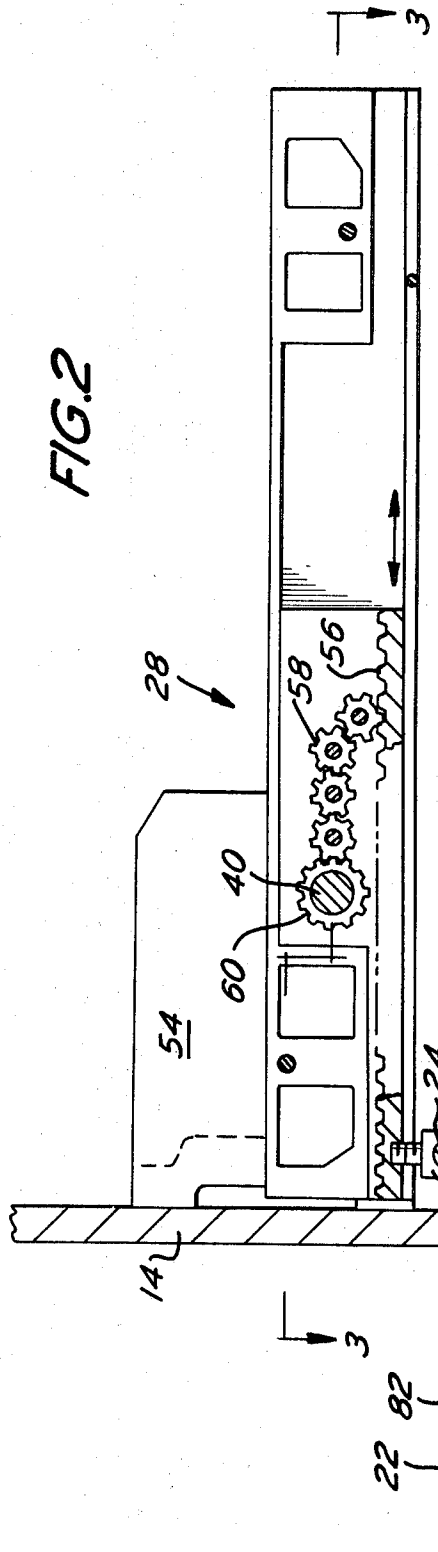
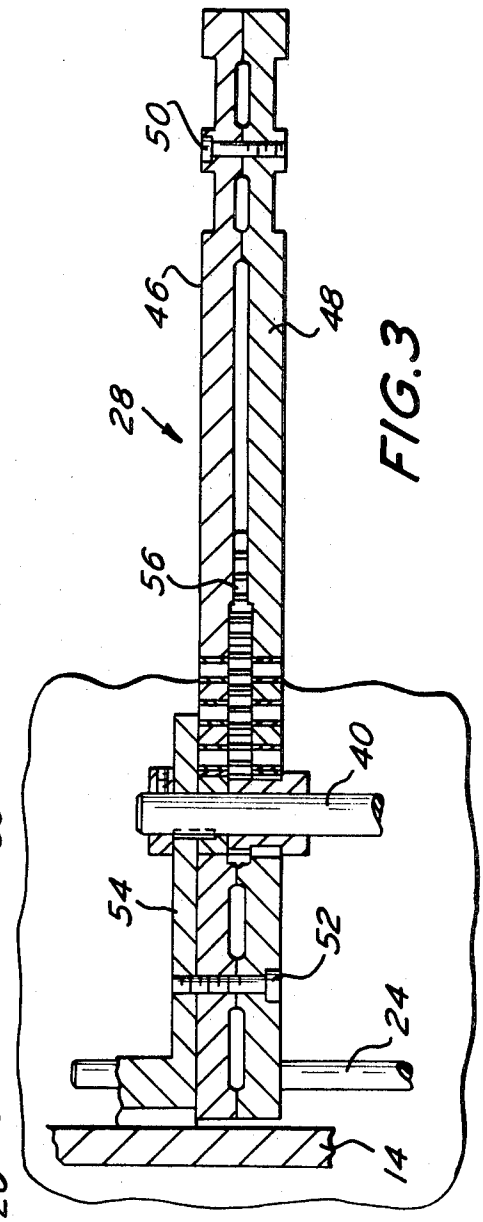



FIG.3




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BOX BLANK FOLDER

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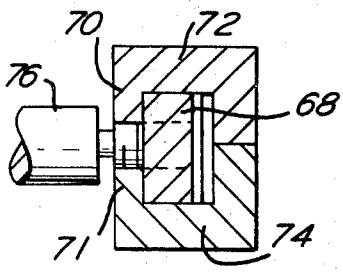



FIG. 10




FIG. 4

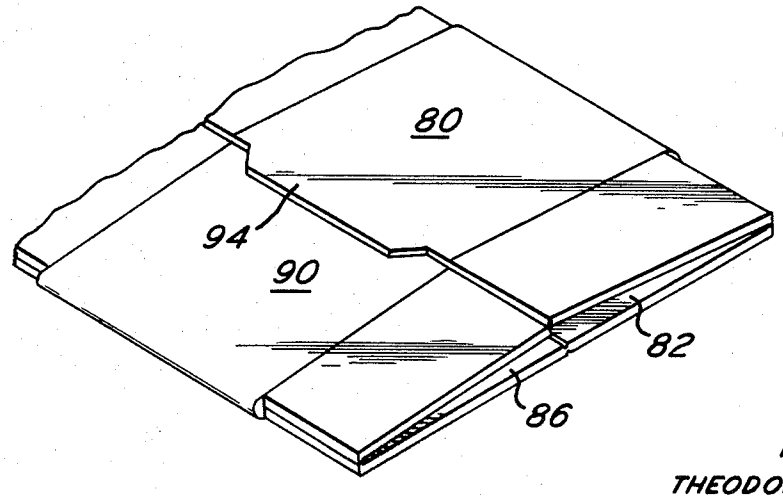



FIG. 11

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3,572,221

# BOX BLANK FOLDER

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Int. Cl. B31b 1/36
U.S. Cl. 93—52 10 Claims

## ABSTRACT OF THE DISCLOSURE

A machine is disclosed for folding box blanks along a fold line and interconnecting the end panels of the box blank by gluing or taping. Means are provided to permit adjustment of a contact member while the machine is running so that the contact member engages the blank at substantially the same distance from a fold line to avoid blank distortion. Means are provided for simultaneously operating positioning means at spaced points along the contact member while the machine is running so that the optimum position for folding the blank may be achieved.

The present invention relates to a machine for folding box blanks. Box blanks are normally fed through a slotter-scorer machine which slots the box blank and scores the same so as to define parallel fold lines. Thereafter, the blank is then fed to a contiguous folder-gluer machine which folds end panels out of the plane of the remainder of the box blank and joins the end panels by gluing or taping. The folding of the end panels may be upwardly or downwardly with respect to a horizontal plane containing the remainder of the box blank.

In accordance with the present invention, the end panels of the box blank are folded by means of contact members disposed one on each side of the machine generally parallel to the path of movement of the box blanks. The contact member is preferably made from a flexible material so that it may be bent by a positioning mechanism at spaced points therealong whereby the contact member will engage the blank at substantially the same distance from the fold line. Each positioning means will position the contact member so as to progressively fold the end panels. Means are provided for simultaneously adjusting the positioning means while the machine is running, thereby avoiding the necessity of stopping the machine when it is desired to improve the fold.

Thus, the box blank folder of the present invention has the advantage of permitting adjustment while the machine is running. The structural interrelationship of the folder is such that any tendency to distort the blank is avoided and quality is improved in that there is a minimal possibility of the end panel being skewed with respect to the next adjacent panel. The folder of the present invention reduces flutter of the blanks and the contact member can be positioned so that it does not smear over printing on the blanks which may still be wet.

It is an object of the present invention to provide a paperboard box blank folder which improves the quality of folding of the end panels of a box blank in a manner which is simple and reliable.

It is another object of the present invention to provide a paperboard box blank folder which permits adjustments of the folding member to be made while the machine is running.

It is another object of the present invention to provide a paperboard box blank folder wherein spaced portions of a panel contact member may be simultaneously positioned so that all portions are substantially the same distance from a fold line on the box blank.

Other objects will appear hereinafter.



For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1A is a side elevation view of the leading end portion of the folder and FIG. 1B is a side elevation view of the trailing end of the folder.

FIG. 2 is a sectional view taken along the line 2—2 in FIG. 1A.

FIG. 3 is a sectional view taken along the line 3—3 in FIG. 2.

FIG. 4 is a sectional view taken along the line 4—4 in FIG. 1B.

FIG. 5 is a diagrammatic view illustrating the structure existing in cross section in the location of the positioning means shown in FIG. 2.

FIG. 6 is a view similar to FIG. 5 but illustrating the structure as it exists adjacent the positioner at the lefthand end of FIG. 1A.

FIG. 7 is a view similar to FIG. 5 but showing the structure as it exists at the righthand end of FIG. 1B.

FIG. 8 is a view similar to FIG. 5 but showing the structure as it appears adjacent the lefthand end of FIG. 1B.

FIG. 9 is a sectional view of a folded glued box blank.

FIG. 10 is a sectional view taken along the line 10—10 in FIG. 4.

FIG. 11 is a partial perspective view of the box blank shown in FIG. 9.

FIG. 12 is a partial perspective view of an alternative form for the contact members.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown in FIG. 1 a folder in accordance with the present invention designated generally as **10**. The folder **10** includes a frame **12**. The frame includes longitudinally extending side plates **14** and **16**. Below the plates **14** and **16**, the frame includes additional longitudinally extending side plates **18**, only one of which is shown. The side plates **18** support rollers **20** at spaced points therealong for supporting the box blank during at least a portion of its travel through the folder of the present invention.

The lower run of a belt **22** is illustrated for contacting the upper surface of the box blanks and causing them to move through the folder. A contact member **24** extends along one side of the machine. A similar contact member **26** extends along the opposite side of the machine. The members **24** and **26** extend generally in the direction of travel of the box blank being processed. The contact members are preferably flexible members made from a plastic material such as nylon. Other flexible materials could be used as the contact member, if desired.

A plurality of positioning means are coupled to each of the contact members **24** and **26** at spaced points therealong. Each of the positioning means is identical except as may be pointed out hereinafter. At a location wherein the box blanks are flat and lie in a horizontal plane, a positioning means **28** is coupled to contact member **24**. At the same general area, a positioning means **30** is coupled to the contact member **26**. The positioning means **28** and **30** are identical. Hence, only means **28** will be described in detail.

Referring to FIGS. 2 and 3, it will be seen that the positioning means **28** includes housing portions **46** and **48** coupled together by bolts **50** and **52**. Bolt **52** secures the housing portions to bracket **54**. Bracket **54** is connected to the side plate **14**.

The positioning means **28** is horizontally disposed. A positioning means **32** is secured to contact member **24** and is disposed at an angle of approximately 45° with

respect to a horizontal plane. A similar positioning means **34** is connected to the contact member **26**. Another positioning means designated generally as **36** is connected to the contact member **24** and is disposed vertically as shown more clearly in FIG. 4. A positioning means similar to means **36** is connected to the contact member **26** on the opposite side.

A positioning means **38** is connected to the contact member **24** and is inclined at an angle of approximately 135° from the horizontal plane. A similar positioning means is connected to the contact member **26**. The various positioning means coupled to contact member **24** are connected to a means for operating them simultaneously, namely shaft **40**. A similar shaft **40'** is provided for operating the positioning means connected to the contact member **26**. A greater number of positioning means may be provided if desired.

Shaft **40** is coupled by sprockets and chain **46** to a motor **44**. Motor **44** is mounted on side plate **14**. A separate motor, not shown, is provided for operating the shaft **40'**. Motor **44** and the motor for shaft **40'** are preferably gear motors which can be driven to rotate the shafts **40** and **40'** through a number of rotations which will actuate the positioning means to the optimum position to effect the folding.

As shown more clearly in FIGS. 2 and 3, the shaft **40** is coupled to a pinion **60** which is in meshing engagement with gears **58**. Gears **58** are meshed with a rack **56**. Rack **56** is supported by inwardly extending flanges on the housing portions **46** and **48**. A jaw **62** embraces the contact member **24**, extends through a slot in the housing, and is threadedly coupled to the rack **56** for movement therewith.

Positioning means **32**, **36** and **38** are all identical except for their angular disposition. Positioning means **32** is angularly disposed so that the box blank will have been folded downwardly through an angle of approximately 45° at the location thereof. Positioning means **38** is located so that the box blank will have been folded through a total angle of 90° at the location thereof as shown in FIG. 7. Positioning means **38** is located so that the box blank will have been folded downwardly through an angle of approximately 135° at the location thereof as shown in FIG. 8. Hence, only positioning means **36** will be described in detail.

Referring to FIG. 4, the positioning means **36** includes a housing, supported from the side plate **14** by a bracket **64**. The housing includes housing portions **72** and **74**. See FIG. 10. The rack designated as **68** is supported by the inwardly extending flanges **70** and **71** and is in meshing engagement with pinion **66** on shaft **40**. A jaw **76** has one end embracing the contact member **24** and its other end is threadedly coupled to the rack **68**. The flanges **71** are spaced apart from one another so as to define a channel within which the reduced diameter portion of the jaw **76** may reciprocate.

Referring to FIG. 5, there is illustrated a flat blank **78** which has been scored and slotted so as to have panels **80** and **82** connected together by a fold line **84**. Panel **82** is connected to a panel **86** by fold line **88**. Panel **86** is connected to panel **90** by a fold line **92**. For purposes of illustration, the panels **80** and **90** will be interconnected by a glue tab designated as **94**. See FIG. 11.

The operation is as follows:

Box blanks which have been scored and slotted by a slotter-scorer are fed to the folder at a high rate of speed such as 200–300 per minute depending upon the box blank size. For purposes of illustrating a box blank in the drawing, it will be noted that the box blank is symmetrical with all of the panels being of the same size. As the panels are moved through the folder under the influence of belt **22** and supported by the rollers **20**, the panels **80** and **90** move beneath contact members **24** and **26**, respectively. Since the folding process is identical, only the folding process effected by contact member **24** will be described in detail.



Motor **44** will have been operated to rotate shaft **40** and thereby preposition the means **28**, **32**, **36** and **38** to a predetermined location wherein member **24** will always contact the panel **80** at a location which is uniformly spaced from the fold line **84**. Preferably, the contact member **24** engages the panel **80** at a location which is closer to the free edge of panel **80** than the fold line **84**.

When the box blank **78** is adjacent the positioning means **28**, the blank lies in a horizontal plane. As the box blank **78** is moved to the location of positioning means **32**, continuous contact with the member **24** will have folded the panel **80** downwardly through an angle of approximately 45° from the position shown in FIG. 5 to the position shown in FIG. 6.

When the box blank **78** arrives at the location of means **36**, panel **80** due to continuous contact with member **24** will have been folded downwardly through an accumulative angle of 90° so as to assume the position shown in FIG. 7.

When the box blank approaches the location of means **38**, continuous contact with the member **24** will have caused the panel **80** to assume the position shown in FIG. 8 wherein it has been moved downwardly through an angle of approximately 135°. Continued movement of the panel **80** until it overlies panel **82** is effected by means of belt **96**. Thereafter, the collapsed box blank as shown in FIG. 9 passes between rollers, not shown, which will insure that glue applied to the tab **94** will be pressed against the juxtaposed surface of panel **90**.

Adjustment of the positioning means can be effected while the folder **10** is operating or inoperative. Such adjustment is attained by operation of motor **44**. Since the line of contact between member **24** and the fold line **84** are parallel, improved quality of folding is obtained in avoiding distortion, whereby panel **80** would not be skewed with respect to panel **90**. If desired, the contact members **24** and **26** could be hollow as shown in FIG. 12 and provided with perforations **27** whereby pressurized air issuing through the perforations **27** would provide a film of air between the box blank and the contact members so as to reduce friction.

The shaft **40'** and the positioning means operated thereby and associated with contact member **26** are preferably independently operated by a separate motor. In this manner, non-uniform blanks may be processed. By non-uniform blanks, it is meant that panel **80** would not be of the same size as panel **90**. Under those circumstances, it would be desirable to have the ability to locate member **24** from fold line **84** by a distance such as 12 inches and locate member **26** from fold line **92** by a distance such as 8 inches. It will be apparent to those skilled in the art that these dimensions are exemplary and will vary from box blank to box blank.

From the above description, it will be apparent that the box blanks are moved in a horizontal plane along a predetermined path. The contact members **24** and **26** extend generally parallel to the path of movement of the box blank panels. The contact members **24** and **26** fold end panels on the blank out of the plane of the remainder of the panels. Such folding may be upwardly or downwardly. Hereinafter, the motor **44** and shaft **40** may be referred to as a means for simultaneously operating the positioning means **28**, **32**, **36** and **38**, while the folder **10** is running or operating.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

**1.** A machine for folding paperboard box blanks as the blanks are moved in a horizontal plane along a predetermined path comprising means for moving end panels

of the blank out of the horizontal plane and through an arc of 180° so that they overlie adjacent panels and are joined to each other, said means including a flexible contact member of finite length capable of being bent and extending generally parallel to said path for engagement with blank end panels to effect folding of the same out of said plane, separate positioning means at spaced points along the path, each positioning means being fixedly connected to a portion of said member for positioning said portions substantially equal distances from a fold line on the blank, said positioning means being supported sequentially orientated at progressively different angles with respect to said plane to progressively fold the end panels through an angle of at least 135° from said plane, and means for simultaneously reciprocating said positioning means relative to its support while the machine is running.

**2.** A machine in accordance with claim **1** wherein each positioning means includes a reciprocable rack connected to said member, each rack being coupled to a drive shaft forming a part of said operating means.

**3.** A machine for folding box blanks as the blanks are moved in a horizontal plane along a predetermined path comprising means for moving end panels on the box blank downwardly out of said plane so that they will overlie adjacent panels and may then be joined together, said means including a contact member of finite length extending generally parallel to said path and made from a flexible material, separate positioning means at spaced points along the path and each coupled to said member at spaced points therealong, each positioning means being disposed at a different angle of inclination with respect to said plane, and means for simultaneously operating said positioning means while the machine is running.

**4.** A machine in accordance with claim **3** wherein the angle of inclination of said positioning means with respect to said plane increases sequentially in the direction of movement of the box blanks.

**5.** A machine in accordance with claim **3** wherein said last mentioned means includes a motor coupled to a shaft disposed generally parallel to said path, each positioning means being connected to said shaft.

**6.** A machine in accordance with claim **1** wherein said contact member is at least partially hollow and provided with perforations so that air may be discharged through the perforations to provide a film of air between the box blank and the contact member.



**7.** A machine in accordance with claim **1** including a pair of side plates, a pair of said flexible members, each of said positioning means being supported by one of said side plates, each positioning means including a rack connected to one of said flexible members and a pinion meshed with the rack for adjusting the position of the flexible members with respect to the side plates.

**8.** A machine for folding paperboard box blanks as the blanks are moved in a horizontal plane along a predetermined path comprising means for moving end panels of the blanks out of the horizontal plane and through an arc of 180° so that they overlie adjacent panels and are joined to each other, a pair of parallel plate members, a pair of flexible contact members of finite length and capable of being bent and extending generally parallel to said path for engagement with blank end panels to fold the end panels out of said plane, positioning means supported by each of said side plates at spaced locations therealong for positioning portions of each contact member a uniform distance from the fold line of the box blanks along the entire length of the contact member, each positioning means being fixedly connected to a portion of said member, and means for simultaneously moving each separate positioning means, relative to its support plate member, toward or away from a fold line on the blanks while the machine is running.

**9.** A machine in accordance with claim **8** wherein said contact members are hollow plastic members.

**10.** A machine in accordance with claim **9** wherein said members are perforated and connectable to a source of pressurized air.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,931,277 | 4/1960 | La Bombard | 93—52 |
| 3,296,945 | 1/1967 | Cvacho et al. | 93—94X |
| 3,335,540 | 8/1967 | Reil et al. | 93—52UX |
| 3,371,585 | 3/1967 | Moser et al. | 93—52 |


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U.S. Cl. X.R.

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