Nov. 9, 1971 P. F. BOWMAN 3,618,482

TRAY FORMING METHOD AND APPARATUS

Filed June 16, 1969 4 Sheets-Sheet 1

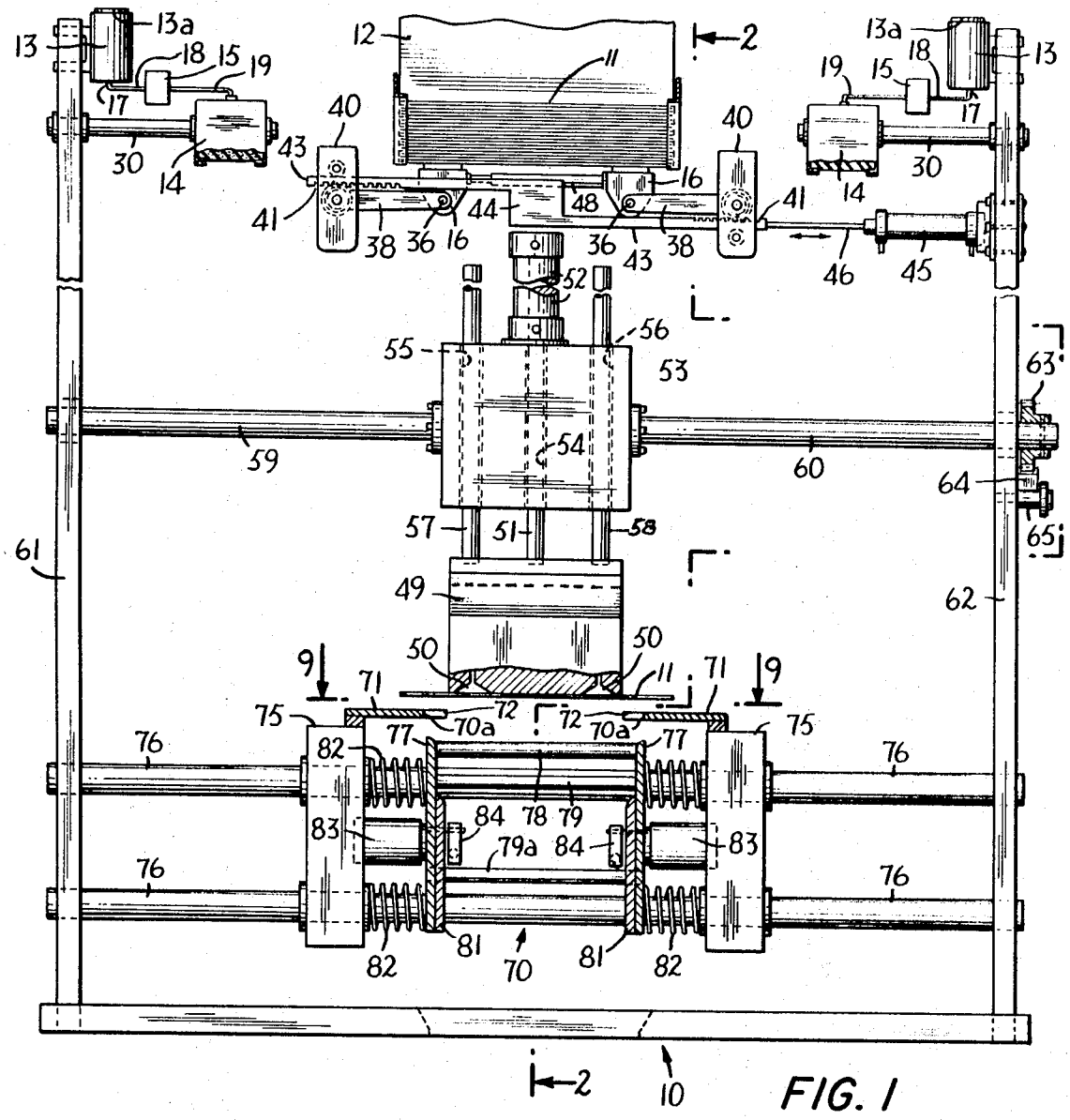


FIG. 1

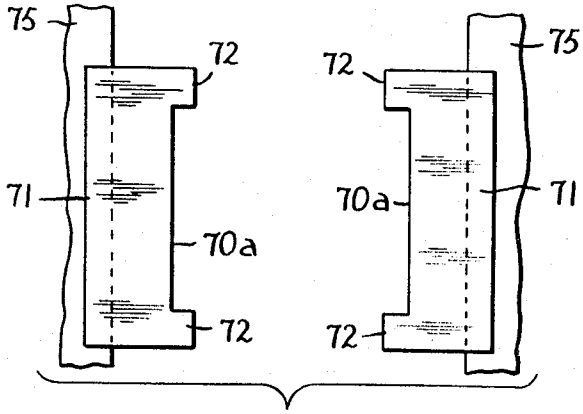


FIG. 9

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TRAY FORMING METHOD AND APPARATUS

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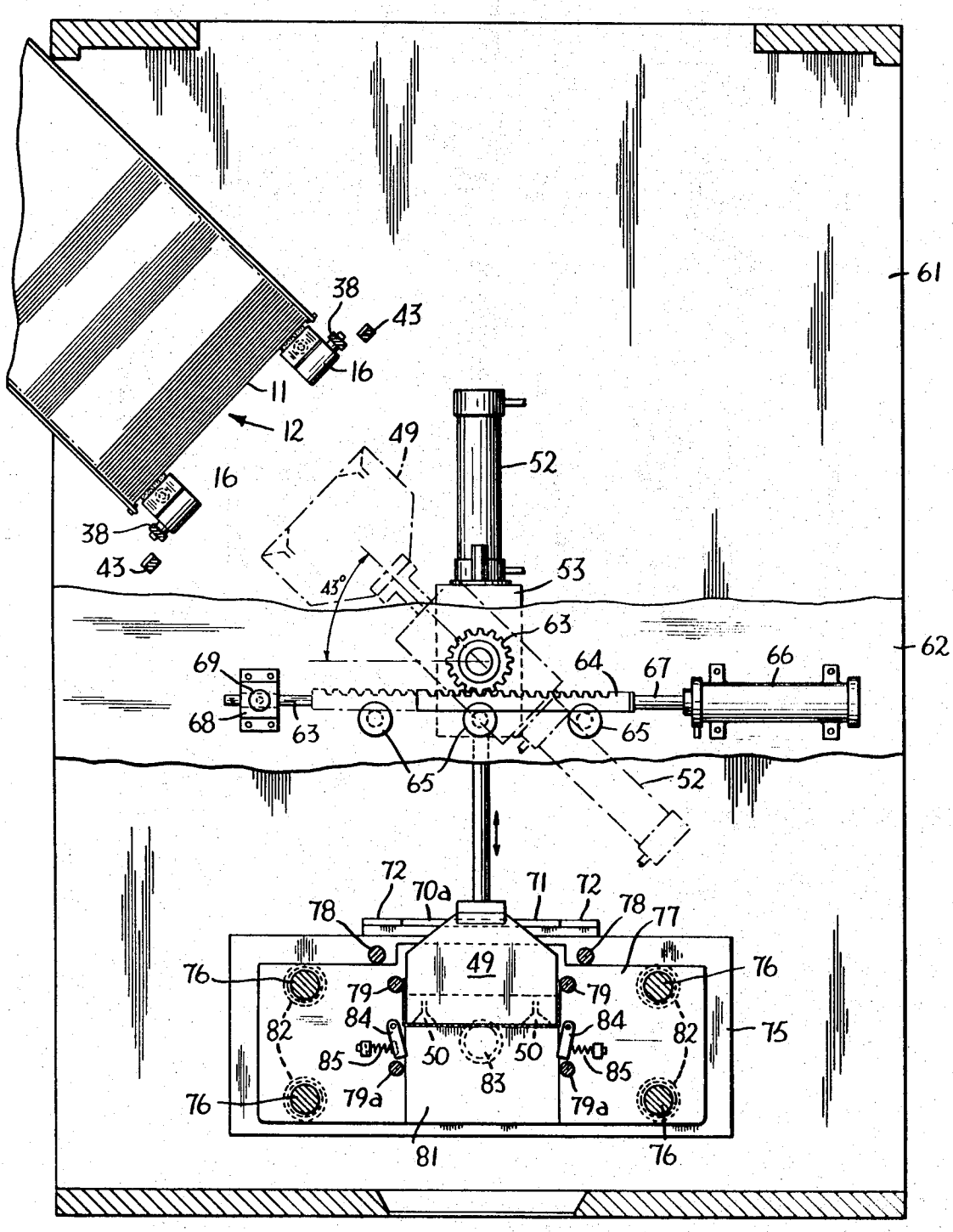


FIG. 2

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Nov. 9, 1971 P. F. BOWMAN 3,618,482

TRAY FORMING METHOD AND APPARATUS

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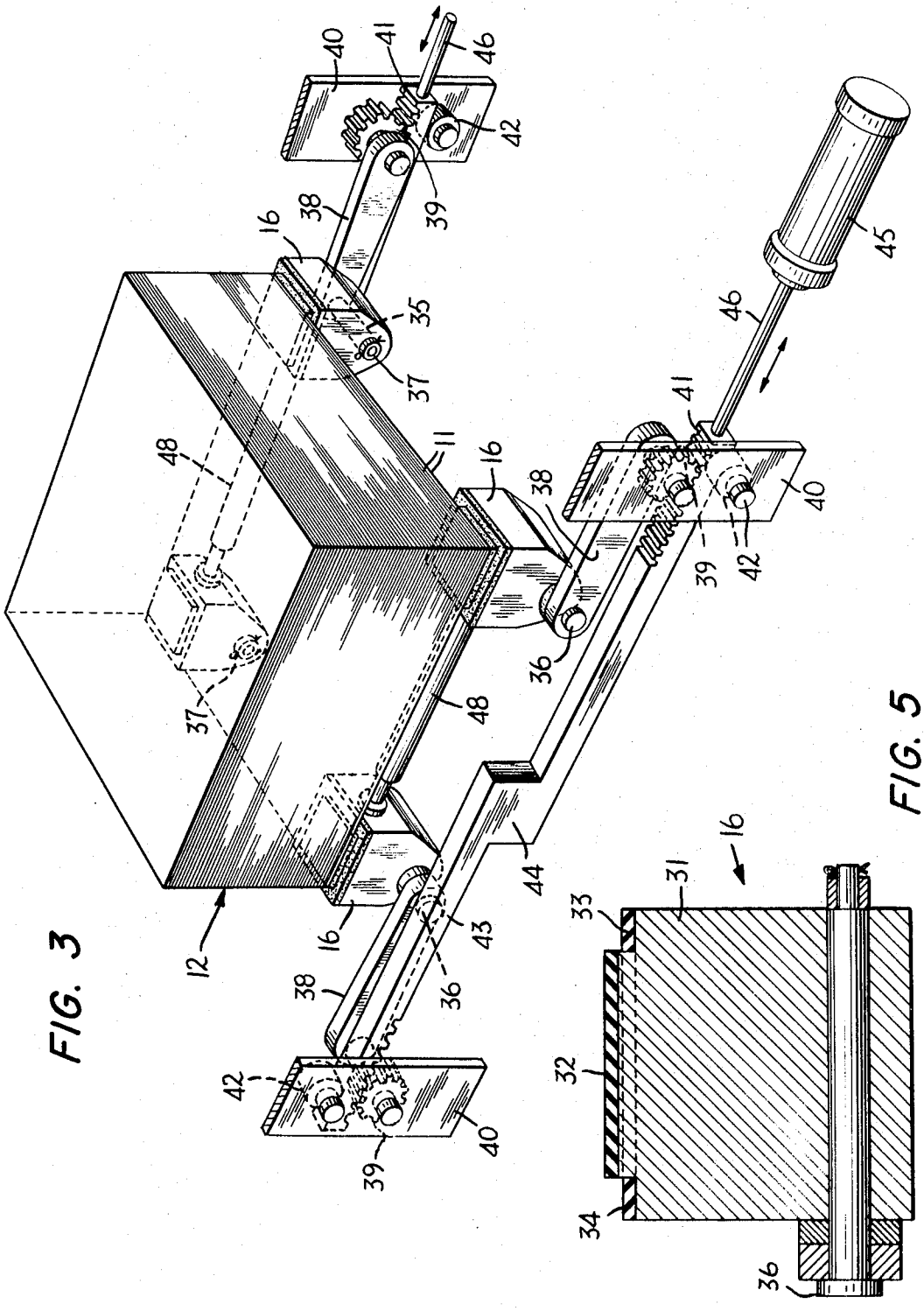


FIG. 3

FIG. 5

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TRAY FORMING METHOD AND APPARATUS

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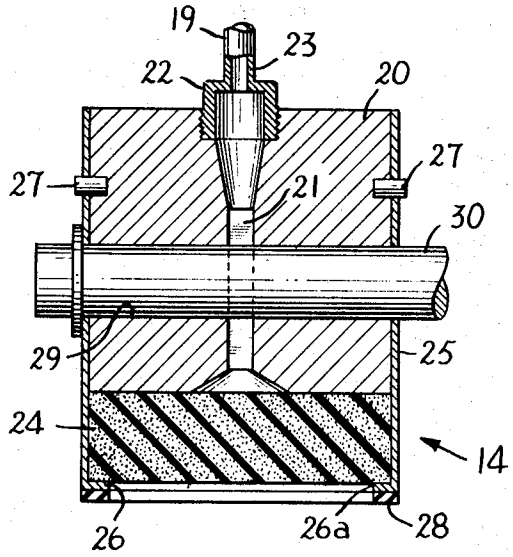


FIG. 4

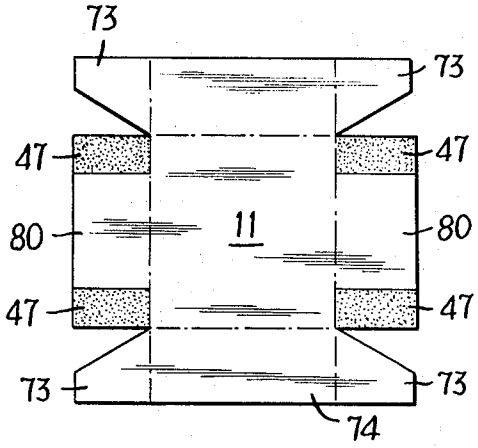


FIG. 6

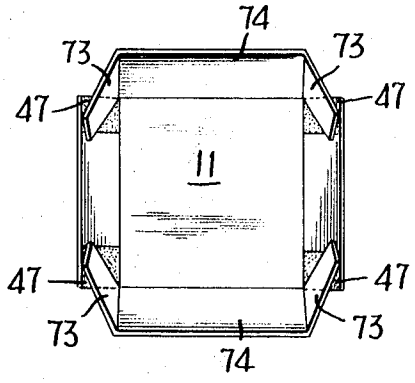


FIG. 7

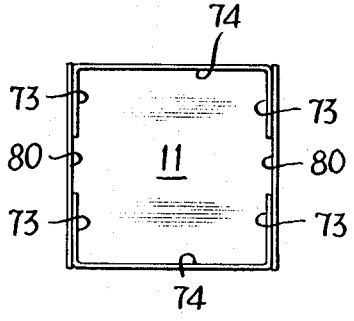


FIG. 8

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Patented Nov. 9, 1971

3,618,482

TRAY FORMING METHOD AND APPARATUS

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Filed June 16, 1969, Ser. No. 832,933
Int. Cl. B31b *1/44*
U.S. Cl. 93—51 18 Claims

ABSTRACT OF THE DISCLOSURE

An "in-line" hydraulically or electrically operated tray forming apparatus is provided for folding paperboard blanks comprising a hopper for holding the paperboard blanks, a glue dobbing apparatus for applying controlled quantities of adhesive to the blank while the blank is in the hopper, a mandrel for removing the glued blank from the hopper and for urging the glued blank into a die cavity within which the blank is progressively folded into a tray.

The present invention relates principally to an "in-line" apparatus and method for forming trays from paperboard blanks.

The apparatus in accordance with the present invention is comprised of a hopper for holding the paperboard blanks, a glue dobbing apparatus for applying controlled quantities of adhesive to preselected areas of the blank, a die cavity and a mandrel for removing a blank from the hopper and for moving the blank into the die cavity where it is folded and formed into a tray. The basic principles and structures of the glue dobbing apparatus and die cavity are disclosed in my copending application Ser. No. 832,782 filed June 12, 1969, entitled "Glue Dobbing and Tray Forming Method and Apparatus."

The present tray forming apparatus has an "in-line" arrangement in that the mandrel is positioned between the hopper and the die cavity, preferably vertically above the die cavity. Subsequent to the deposition of adhesive on the blank by the glue dobbing apparatus, the mandrel removes the glued blank from the hopper and by a combination of rotational and linear movement, moves the glued blank into the die cavity. Both the die cavity and mandrel then coact with each other to fold the blank into a finished tray.

Without the "in-line" arrangement of the present invention the movement of the glue dobbing apparatus and mandrel has been mechanically driven and controlled. A mechanical drive generally requires mechanical linkage connections between the glue dobbing apparatus and mandrel to permit the proper sequence of operation of these parts. Very heavy moveable supports are usually required to assure proper mandrel operation and somewhat complicated mechanical structures are needed for rotating and moving the mandrel and its support. Such a system is depicted in the embodiment described in my copending application Ser. No. 832,782.

It has now been found that when the mandrel is constructed in an "in-line" arrangement and driven by hydraulic means it is possible to eliminate the heavy moveable mandrel supports and eliminate the complicated mechanical structures needed to move the mandrel between the hopper and die cavity. This results in a large reduction in the cost of the apparatus. The elimination of the heavy supports decreases the inertia load on the apparatus drive system thereby increasing the number of trays that the apparatus can fold from about 20 to about 60 per minute.

Both the glue dobbing apparatus and mandrel motion are controlled by separate hydraulic cylinders which may be self contained units or units that are fed hydraulic fluid through a plurality of control valves which in turn control the motion of the hydraulic cylinders.

In a preferred embodiment, the mandrel is slidably mounted in a bushing block which is in turn mounted in fixed position on a rotatable shaft. Sliding movement of the mandrel and rotational movement of the mandrel and bushing block is controlled by a second hydraulic cylinder which rotates the shaft to which the bushing block and mandrel are mounted between a first position in which the mandrel is facing the hopper and a second position in which the mandrel is facing the die cavity. Linear movement to the extremes in each of the two positions is controlled by the first hydraulic cylinder.

The use of separate hydraulic cylinders to control the rotation and linear movement of the mandrel makes it possible to position the hopper at an angle to the vertical which is not generally possible with a mechanical drive system. In the mechanical drive systems, the linear movement of the mandrel is generally confined to a vertical path due to a practical design consideration. Placing the hopper on an angle, preferably about 43 degrees from the vertical permits one side of the hopper to act as a support for the blanks, thereby permitting thinner blanks to be stacked within the hopper without danger of the blanks buckling.

The movement of the glue dobber and mandrel may be controlled electrically or by pneumatics instead of hydraulically. However, the cost of electrical apparatus to control dobber and mandrel movement is significantly greater than the simple hydraulic drive means and is therefore not as desirable.

Referring now to the drawings which depict a preferred embodiment of the invention and in which like numerals refer to like parts:

FIG. 1 is a schematic diagram of a hydraulically operated tray forming apparatus;

FIG. 2 is a partial side view of the apparatus of FIG. 1 taken along line **2—2** thereof in which the components for moving the glue dobbing apparatus have been eliminated for the sake of clarity;

FIG. 3 is a partial schematic view of the dobber arrangement of the FIG. 1 embodiment;

FIG. 4 is a sectional view of the glue fountain assembly of FIG. 1;

FIG. 5 is a detail view of the dobber of FIG. 1;

FIGS. 6–8 depict a blank in the various stages of its formation into a tray.

FIG. 9 is a detail view of the preformer plates taken along line **9—9** of FIG. 1.

FIG. 1 is a schematic representation of a hydraulically operated tray former apparatus **10**. A plurality of paperboard blanks **11** which may or may not be varnished are carried in a hopper **12** which has conventional means (not shown) for adjusting its internal dimensions to adapt the hopper for different size blanks.

The first step in the tray forming process performed by the depicted apparatus is the application of adhesive to the blank **11** at preselected points. The application of adhesive to the blank is achieved by the glue dobbing apparatus shown in FIGS. 1–5 in which **13** is a glue tank, **14** is a glue fountain, **15** is a solenoid valve and **16** is a glue spotter.

Glue tank **13** is a conventional type tank having an opening at the top which is closed by removable screw means **13***a* through which adhesive is added to the tank. Glue tank **13** has a bottom opening **17** to allow adhesive to exit from the tank. The adhesive used is preferably a water based emulsion such as polyvinyl acetate or any of the dextrin family of adhesives. Connected to opening **17** is a feed line **18** which is in fluid communication with a conventional solenoid valve **15**. Adhesive from tank **13** is fed under pressure to the solenoid valve **15** by means of the height differential between the tank **13** and the solenoid valve **15**. A feed line **19** is connected

in fluid communication between the solenoid valve **15** and glue fountain **14** whereby the solenoid valve regulates the flow of adhesive between the glue tank **13** and fountain **14**. In place of a height differential between the tank and fountain, a conventional pressure pump may be used to supply adhesive under pressure to the glue fountain.

The solenoid valve **15** is adapted for intermittently permitting the adhesive to flow from tank **13** to fountain **14**, and preferably operates to permit flow once for each blank. However, if a continuous flow of adhesive to the fountain is desired, the solenoid may be set to remain continuously open or it may be removed from the system altogether.

Glue fountain **14** (FIG. 4) is comprised of a solid block of metal **20** which has a bore **21** therein. One end of bore **21** is threaded at **22** to receive a complementary threaded nut **23** to which line **19** is connected for the feeding of adhesive from solenoid **15** to the glue fountain. Mounted at the bottom of block **20** is a block of natural sponge or sponge rubber **24** which receives the adhesive and is held in place against block **20** by mask **25**. Mask **25** has an annular, inwardly extending flange **26** and an opening **26***a* therein. The mask slips over both block **20** and sponge **24** and the mask is fixedly mounted on block **20** by conventional screw means **27**. Sponge **24** is fed adhesive through bore **21** which preferably deposits the adhesive near the center of sponge **24** to aid in achieving the uniform distribution of adhesive throughout the sponge. Mounted on flange **26** by adhesive or any other suitable means is an annulus of sealing material **28**, such as Teflon, the purpose of which will be described below. The block **20** has a bore **29** therein for slidably accepting a shaft **30** on which the glue fountain may be moved closer to or farther from the hopper to coincide the glue fountain with spotter movement should the position of the spotters be changed.

Spotter **16** (FIG. 5) is comprised of a solid block of material **31** such as steel or hard rubber. Spotter **16** has a raised upper surface **32** which preferably has a cross hatched or etched surface (not shown) for better distribution of adhesive on the spotter surface. Surface **32** is of smaller dimensions than block **31** and its dimensions must be equal to or less than the dimensions of opening **26***a* in mask **25** (FIG. 4) to permit the raised surface **32** to enter the mask opening **26***a* and contact the sponge **24**. The dimensions of the block **31** must be larger than the dimensions of opening **26***a* in mask **25**. The difference in dimensions between raised surface **32** and spotter block **31** forms a shoulder **33** at the juncture between the raised surface and the spotter block to which is mounted an annulus of sealing material **34**, preferably Teflon. In operation, adhesive is transferred from glue fountain **14** to the surface **32** of the spotter by contacting surface **32** to sponge **24** to slightly compress the sponge to force adhesive to transfer to the raised surface of the spotter. For best results, it is preferred that sealing material **34** be in contact with sealing material **28** on the glue fountain to prevent leakage of adhesive from the sponge along the sides of the spotter during compression of the sponge. The amount of adhesive transferred from the sponge to the spotter is controlled by the amount of adhesive present in the sponge and the amount of compression thereof by the spotter. The raised surface **32** of the spotter may be separate from block **31** and mounted thereon by conventional spring means (not shown). In this manner, the raised surface **32** of the spotter will adjust itself to compensate for any angular irregularity in the position of the fountain or of the blank in the hopper. Alternatively, block **31** may be cut along a line parallel to the surface **32**, the two portions of block **31** being connected to spring means to permit the whole upper portion of the block **31** to adjust itself to compensate for any such irregularities.

The structure of the spotter and glue fountain permits sealing of the glue fountain by the spotter during periods in which the machine is not operating to prevent the setting of adhesive within the glue fountain. This is achieved by the sealing material **28** of the glue fountain being contacted and pressed by the sealing material **34** carried on shoulder **33** of the spotter. In this manner, air is kept out of the glue fountain. Glue fountain **14** may be constructed without the use of a mask by simply bonding the sponge **24** to the block **20** and the spotter may be constructed without a raised surface or shoulder if the advantages of permitting the machinery to remain idle without attendant setting of adhesive in the glue fountain and of preventing flow of adhesive along the sides of the spotters are not wanted or needed.

Hopper **12** is at a 43° angle to the vertical as shown in FIG. 2 to permit the stacking of thin, paperboard therein without buckling. The hopper angle may be set to any angle as long as the blanks carried in the hopper do not buckle.

Referring now to FIGS. 1 and 3, there is shown a preferred manner of moving the spotters between the glue fountains **14** and blank **11**. Each of the spotters **16** (four in the particular embodiment of which only two are shown in FIG. 1) are fixedly mounted by conventional means to shafts **35**. Ends **36** ad **37** extend beyond the spotter **16**. Rotatably mounted to end **36** is a crank arm **38** which is in turn fixedly mounted to rotatable gear **39**. Gear **39** is rotatably mounted to support **40** and is positioned to engage a tooth rack **41**. Rack **41** rests on idler roller **42** which assures that the rack is always in engagement with gear **39**. Supports **40**, gears **39**, shafts **35** and spotters **16** are on the same angle as hopper **12**.

Rack **41** is fixedly connected by conventional means to a second rack **43** by spacer block **44**. The rack **43**, in contrast to rack **41**, engages the upper surface of its associated gear **39** rather than the lower surface thereof. The reason for this will be explained below. A second glue spotter **16** is mounted and moved by gear **39** between its associated glue fountain and the blank as described hereinbelow.

Spotters **16** must move between glue fountain **14** to pick up adhesive and blank **11** where the adhesive carried by the spotter is deposited on the blank. To achieve this in the embodiment depicted in FIG. 1, the right and left hand spotters must rotate in opposite directions from the position which is shown in order to contact the glue fountains. The opposite direction movement of the spotters is achieved by the hydraulic cylinder **45** which has an extensible shaft **46** fixedly connected to rack **41**. Hydraulic withdrawal of shaft **46** rightwardly in FIGS. 1 and 3 urges the rack **41** and **43** rightwardly in FIGS. 1 and 3. The rightward movement of rack **41** causes gear **39** which is associated therewith to rotate counterclockwise, thereby rotating the right spotter **16** counterclockwise into contact with its associated glue fountain. Rightward movement of rack **43** causes clockwise movement of the gear **39** associated with rack **43** and consequent clockwise rotation of the left spotter into contact with its associated glue fountain. In reverse, extension of shaft **46** when the spotters are in contact with the glue fountains will cause the spotters to rotate into contact with the blank to apply adhesive thereto at **47** as shown in FIG. 6.

In order to provide controlled rotation of the spotters in crank arm **38** to keep them upright and to provide additional support for the spotters, an extensible member **48** is fixedly connected to extension **37** of both right and left spotters. This assures that the raised surface **32** of the spotters will always be properly oriented in upright position for contacting both the sponge and blank.

The rotation of the spotters may be controlled separately by removing spacer block **44** and independently moving each rack by a separate hydraulic cylinder or by conventional means capable of hydraulic operation such

as crank shaft arrangement. Also, each pair of opposed crank arms **38** i.e. the two right or left hand crank arms as seen in FIG. 3 may be fixedly connected to each other as by a cross bar not shown whereby only one hydraulic cylinder and one rack and pinion assembly need be utilized instead of two as shown.

Referring now to FIGS. 1 and 2, there is seen a mandrel **49** having a plurality of suction cups **50** therein for removing blanks **11** from hopper **12**. Suction cups **50** may be conventional rubber contact cups or simple openings in which a vacuum is induced by conventional mechanical pump or fan means (not shown). Mandrel **49** is fixedly mounted by conventional means (not shown) to extensible hydraulic cylinder shaft **51** which is in turn a part of hydraulic cylinder **52**. Hydraulic cylinder **52** is fixedly mounted to a bushing block **53** which has a bore **54** therein through which the shaft **51** slidably extends. Bushing block **53** also has two additional bores **55, 56** therein in which mandrel guide shafts **57, 58** respectively are slidably mounted. Guide shafts **57, 58** are present only for stabilization of the mandrel in its movement as hereinafter described.

Bushing block **53** is fixedly mounted by conventional means to a pair of rotatable shafts **59, 60** which are journalled in side frames **61, 62** of the tray former apparatus respectively. Shaft **60** extends through side frame **62** and is fixedly connected in conventional manner to a rotatable toothed gear **63** (FIG. 2). Moveably mounted to side frame **62** is a toothed rack **64** which is supported on a plurality of idler rolls **65**. The teeth of rack **64** engage the teeth of gear **63**. A hydraulic cylinder **66** is mounted by conventional means to the side frame **62**. The cylinder **66** has an extensible shaft **67** which is fixedly connected to rack **64** by conventional means. When the mandrel is in the position shown in FIG. 1 extension of shaft **7** causes leftward movement of rack **64** as seen in FIG. 2 which in turn rotates gear **63** clockwise to thereby rotate mandrel **49** clockwise. In this manner, the mandrel is rotated between a first position in which it faces the hopper **12** and a second position in which it faces die cavity **70** (FIG. 1). A stop **68** is adjustably positioned on side frame **62** and in slot **63** by screw means **69** to limit the movement of rack **64** and thereby the maximum amount of rotation of mandrel **49**. Any hydraulically operated means other than described such as a conventional crank and gear arrangement may be used to rotate the shaft **60**.

In operation, the glue spotters **16** are rotated into contact with blank **11** in hopper **12** to deposit adhesive on predetermined areas **47** of the blank (FIG. 6). Spotters **16** are then rotated away from blank **11** and into contact with glue spotters **14** for the twofold purpose of leaving the blank unobstructed and preventing the adhesive from setting in the glue fountain.

After the spotters **16** have been rotated away from blank **11**, the mandrel **49** is in the position shown in FIG. 1 with the sole exception that at this time, it will not be carrying a blank. Mandrel **49** is rotated in clockwise direction by rightward movement of shaft **67** of hydraulic cylinder **66** (FIG. 2) to rotate gear **63** and shaft **60** until rack **64** contacts stop **68**. At this point, the mandrel surface containing suction cups **50** is facing the hopper **12** and is positioned under the just glued blank **11**. When the mandrel is in this position, hydraulic cylinder **52** is operated to extend shaft **51** and thereby extend mandrel **49** until it contacts the blank **11** and the suction cups **50** have been compressed sufficiently to hold the blank **11** by suction. The mandrel and blank are then withdrawn from the hopper by operation of hydraulic cylinder **52** to retract shaft **51** and the mandrel and blank are then rotated in counter-clockwise direction to the position just above die cavity **70** as shown in FIG. 1 by retraction of shaft **67** by hydraulic cylinder **66** (FIG. 2).

Positioned above die cavity **70** are a pair of preformer plates **71** (FIG. 9) which have a plurality of flanges **72** thereon. Flanges **72** fold flaps **73** (FIG. 6) upwardly as the mandrel **49** pushes blank **11** between the preformer plates. Edges **70***a* of preformer plates **71** initiate folding of end flaps **80** to less than a vertical position as shown in FIG. 7. A greater amount of folding is given to flaps **73** by preformer plates **71** than to end flaps **80** to prevent contact of adhesive **47** by end flaps **73**.

Each preformer plate **71** is fixedly mounted to a bolster **75** which in turn is slidably mounted to a plurality of shafts **76** (two of four shown). Bolster **75** is capable of movement towards and away from the die cavity **70** to permit the die cavity to be changed or adjusted for various size trays. Conventional means such as thumb screws (not shown) are used for fixing the bolsters **75** in predetermined position on shafts **76**.

Die cavity **70** is positioned inwardly of bolsters **75** and below preformer plates **71** and is comprised of pressure plates **77** which are slidably mounted to shafts **76**. For best results, the spacing between pressure plates **77** is made approximately equal to or less than the distance between edges **70***a* of preformer plates **71** so that the pressure plates **77** will at least hold the degree of fold given to end flaps **80** by the preformer plates **71**.

Slidably mounted to pressure plates **77** are two pairs of forming bars **78, 79** which initiate folding of end flaps **74** (FIGS. 6 and 7). Forming bars **78** fold end flaps **74** to an approximately forty-five degree angle and forming bars **79** to complete the folding of end flaps **74** to a substantially vertical position. For best results, forming bars **78** are positioned below preformer plates **71** a distance less than the projected vertical length of partially folded flap **73** so that the folding of end flaps **74** will begin while flaps **73** are still in a folded position.

The continuous folding of end flaps **74** alleviates the possibility of the blank ripping during the initiation of folding which may happen if forming bars **78** are set so as to immediately fold end flaps **74** to a vertical position. Positioned below forming bars **79** is an additional forming bar **79***a* whose function is simply to help retain the degree of fold given to end flaps **74** by forming bar **79**. However, only one forming bar may be used if desired. Also, more than two forming bars may be used if more gradual folding is desired.

As mandrel **49** continues its movement into die cavity **70**, blank **11** is brought into contact with former plates **81** which fold end flaps **74** an additional amount. Former plates **81** are fixedly mounted to pressure plates **77** and are spaced apart an amount sufficient to permit a clearance of approximately $\frac{1}{32}$ inch or greater to remain between end flaps **80** and flaps **73** during mandrel movement to prevent flaps **73** from destroying the fidelity of the deposited adhesive **47**. To keep the proper separation distance between former plates **81**, conventional springs **82** are provided to urge the former plates outwardly from the die cavity **70** to a position determined by hydraulic pressure cylinders **83** which act as stops for pressure plates **77**.

Mandrel **49** urges blank **11** into the die cavity until the edge of each end flap **74** is below strippers **84**. Strippers **84** are rotatably mounted to pressure plates **77** in conventional manner and are biased inwardly and into the die cavity by conventional springs **85** (FIG. 2). Stripper means **84** are rotated outwardly out of the die cavity by movement of the blank and mandrel into the die cavity until the edges of end flaps **74** of the blank are below the stripper means. When this occurs, springs **85** urge strippers **84** inwardly over the edge of the flaps for reasons described hereinbelow. At this point, downward movement of the mandrel is stopped and hydraulic cylinders **83** activated to urge pressure plates **77** and former plates **81** inwardly to remove the clearance between end flaps **80** and flaps **73** and to press flaps **73** against the mandrel with at least 1000 p.s.i. of pressure for at least $\frac{1}{8}$ second and preferably for $\frac{1}{4}$ second or more to cause the adhesive **47** to penetrate the substrata of the paperboard. The application of such

high pressures causes the adhesive to assume properties not unlike those of a pressure sensitive adheive whereby a primary bond between flaps **73** and end flaps **80** is achieved before the adhesive has set. The formed tray is shown in FIG. 8.

After the primary bond has been achieved, hydraulic cylinders **83** are deactivated to permit springs **82** to move pressure plates **77** outwardly. At this point, hydraulic cylinder **52** is operated to withdraw shaft **51** to thereby move the mandrel out of the die cavity. Strippers **84** strip the formed tray from the withdrawing mandrel by engaging the upper edges of the formed tray whereby the said formed tray remains in the die cavity **70** where it is held by the bars **79***a*.

After the mandrel **49** is withdrawn from the die cavity, the steps of applying adhesive to the blank, movement of the blank from hopper to die cavity by the mandrel and the forming of the blank into a tray is repeated. The movement of the mandrel into the die cavity with the next blank pushes the formed tray remaining in the die cavity **70** out of the bottom thereof. Conventional means such as roller belts (not shown) are used to remove the pushed out tray from the vicinity of the apparatus. In the case of a blank which has dust flaps or a hinged cover (not shown) the dust flaps or cover will be supported vertically between the mandrel **49** and either the plates **77** and **81** or the forming bars **78**, **79**. In such case, means must be provided for removing the folded blank from the die cavity prior to the movement of the next subsequent blank into the die cavity to prevent the mandrel and the blank to be folded from crushing the dust flaps or hinged cover. Such means may take the form of an articulated stripper plate (not shown) which is mounted on the bottom of the mandrel and which is adapted to extend as the mandrel is withdrawn from the die cavity to push the folded tray out of the die cavity. Other means, such as a moveable air or hydraulically operated suction plate (not shown) having means therein for applying suction to the bonded blank may be used by positioning the suction plate under the die cavity and providing means for extending and operating the plate to remove the bonded blank from the die cavity after the mandrel has been withdrawn from within the bonded blank. The implementation of such additional removal means is within the skill of the art.

The described embodiment utilizes hydraulics to initiate control and perform the functions of applying adhesive to the blank, linearly moving and rotating the mandrel and forming the blank into a tray. Through the use of hydraulics, many advantages over mechanically driven systems are achieved such as the elimination of large moving masses of metal which are normally required where mechanical drive systems are used. The large metal mass generally required in the mechanical drive system significantly increases the initial and operational cost of the apparatus which has no gain in quality of the finished product. Also, the large inertia forces which are present in such a mechanical system tend to limit production speed to about 20 trays per minute whereas the hydraulic control method permits formation of up to about 60 trays per minute.

The present invention may be used to fold blanks other than the trays described hereinabove. Also, the adhesive need not be deposited in the area shown and may be deposited on the depicted unglued end flaps instead. It is within the ordinary skill of those versed in the tray forming art and in combination with the teaching of this invention to modify the glue dobbing apparatus to spot adhesive at any location and to modify the preformer plates, die cavity and mandrel to form a different type blank or differently glued blank into a tray.

It is therefore intended to cover all changes and modifications of the preferred embodiments of the invention herein chosen for the purpose of illustration which do not constitute a departure from the spirit and scope of the invention.

What is claimed is:

1. An apparatus for folding blanks comprising: a hopper for holding said blanks, a glue dobbing apparatus adapted to apply adhesive to said blanks in the hopper, a mandrel and die cavity, said mandrel having means for removing blanks from said hopper; means for moving and rotating said mandrel between a first position in which said mandrel removes blanks from said hopper and a second position in which said mandrel has pushed said blank into said die cavity, said die cavity having means for folding said blanks as the mandrel pushes the blank into the die cavity, whereby the blank is folded to overlap selected areas of which at least one has an adhesive thereon and means for applying at least 1000 p.s.i. of pressure to said folded blank for at least ⅛ second to bond said overlapped areas together.

2. An apparatus as specified in claim **1** wherein said mandrel is slidably mounted to a rotatable means, said means for rotating and moving said mandrel between said first and second position comprising first hydraulic cylinder means for rotating said rotatable means to rotate said mandrel between a position in which said mandrel faces said hopper and another position in which the mandrel faces the die cavity and second hydraulic cylinder means for linearly moving said mandrel into contact with said glued blank when said mandrel is facing said hopper and for pushing said glued blank into said die cavity when said mandrel is facing said die cavity.

3. An apparatus as specified in claim **1** further comprising means for retaining said bonded blank within said die cavity as said mandrel is withdrawn therefrom after said pressure has been released and means for removing said bonded blank from said die cavity.

4. An apparatus as specified in claim **2** wherein said rotatable means is a rotatable shaft, said mandrel being slidably mounted to a bushing block which is in turn fixedly mounted to said rotatable shaft, said second hydraulic cylinder means being fixedly mounted to said bushing block and having an extensible shaft to which said mandrel is mounted whereby rotation of said shaft rotates said mandrel and said second hydraulic cylinder means and extension and retraction of said extensible shaft linearly moves said mandrel.

5. An apparatus as specified in claim **1** wherein said hopper is positioned above said means for moving and rotating said mandrel.

6. An apparatus as specified in claim **5** wherein said hopper is at a 43° angle to the vertical.

7. An apparatus as specified in claim **1** in which said blank is comprised of a plurality of flaps and end flaps, some of the end flaps having adhesive thereon further comprising a plurality of preformer plates positioned above said die cavity for initiating the folding of the flaps and the glued end flaps of the blank which have adhesive thereon to assure that the flaps are positioned inside the glued end fljps which have adhesive thereon before the blank is pushed into the die cavity by the mandrel.

8. An apparatus as specified in claim **1** wherein said die cavity has a plurality of forming bars and a plurality of moveable plates, said forming bars being placed transverse to said moveable plates, said forming bars being adapted for folding the unglued end flaps of the blank which do not have adhesive thereon to an approximate vertical position as said mandrel pushes said blank into said die cavity, said moveable plates being diagonally opposed and initially spaced apart from each other a predetermined distance to leave a predetermined clearance between the flaps and the end flaps which have adhesive thereon to prevent the flaps from destroying the fidelity of the adhesive on the end flaps which have adhesive thereon and hydraulic cylinder means for moving said moveable plates inwardly to remove said clearance

and to apply said at least 1000 p.s.i. of pressure for said at least ⅛ second.

9. An apparatus as specified in claim **3** wherein said means for retaining said bonded blank within said die cavity comprises stripper means, said stripper means being rotatably mounted within said die cavity and biased to normally project into said die cavity, said stripper means being adapted for rotation out of said die cavity by said mandrel as said mandrel pushes said blank into the die cavity and for automatic rotation back into said die cavity when the folded blank has been moved to a position below the said stripper means to strip the folded and bonded blank from the mandrel as the mandrel withdraws from the die cavity.

10. An apparatus as specified in claim **3** wherein said bonded blank is removed from said die cavity by said mandrel when the mandrel is again moved into the die cavity to fold and bond another blank.

11. An apparatus as specified in claim **8** wherein said plurality of forming bars comprises at least two pairs of forming bars, one pair of which is spaced vertically above the other pair, the bars of a vertically higher pair being diagonally spaced from each other a greater distance than the bars of the lower pair to fold the end flaps which do not have adhesive thereon to said vertical position.

12. An apparatus as specified in claim **1** wherein said adhesive is a water based emulsion chosen from the group consisting of a polyvinyl acetate and dextrin.

13. An apparatus as specified in claim **1** wherein said mandrel has suction means to removing the glued blank from the said hopper.

14. An apparatus as specified in claim **13** wherein said suction means is a plurality of rubber cups.

15. A method of folding blanks in an apparatus of the type that includes a hopper for holding blanks positioned above a die cavity in which the blanks are folded to form an open container which comprises the steps of:

(a) applying glue to selected areas of the exposed face on one side of a blank in the hopper;
(b) removing said blank from the hopper;
(c) rotating the blank to bring the unglued face of the second side of the blank into position over the die cavity;
(d) inserting the blank into the die cavity;
(e) folding the blank to bring the selected areas of glue into overlapping relationship with other unglued areas of the blank;
(f) pressing the overlapped areas together under pressure of at least 1000 p.s.i. for at least ⅛ second to bond the overlapped areas together to form the container; and
(g) then removing the container from the die cavity.

16. A method as specified in claim **15** further comprising the step of maintaining a clearance between the selected areas which have glue thereon and the other selected areas of the blank during the step of folding said blank.

17. A method as specified in claim **15** further comprising the step of pressing the overlapped areas together after the step of folding the blank has been completed and prior to the step of applying said pressure.

18. A method as specified in claim **1** wherein the step of removing the blank from the die cavity further comprises pushing the bonded blank out of said die cavity by again moving the mandrel into the die cavity to fold another blank.

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