United States Patent

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[72] Inventor **Sigurd J. Hoyrup**
Monta Vista, Calif.

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[73] Assignee **Kliklok Corporation**
New York, N.Y.

[54] **DAUBER-TYPE ADHESIVE APPLICATOR FOR FOLDING BOX MACHINES**
3 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** ..... **93/51 R,** 93/36 MM, 93/36.3, 93/53 SD
[51] **Int. Cl.** **B31b 1/06,** B31b 1/48, B31b 1/62
[50] **Field of Search** ..... 93/36 MM, 36.3, 51, 53 M

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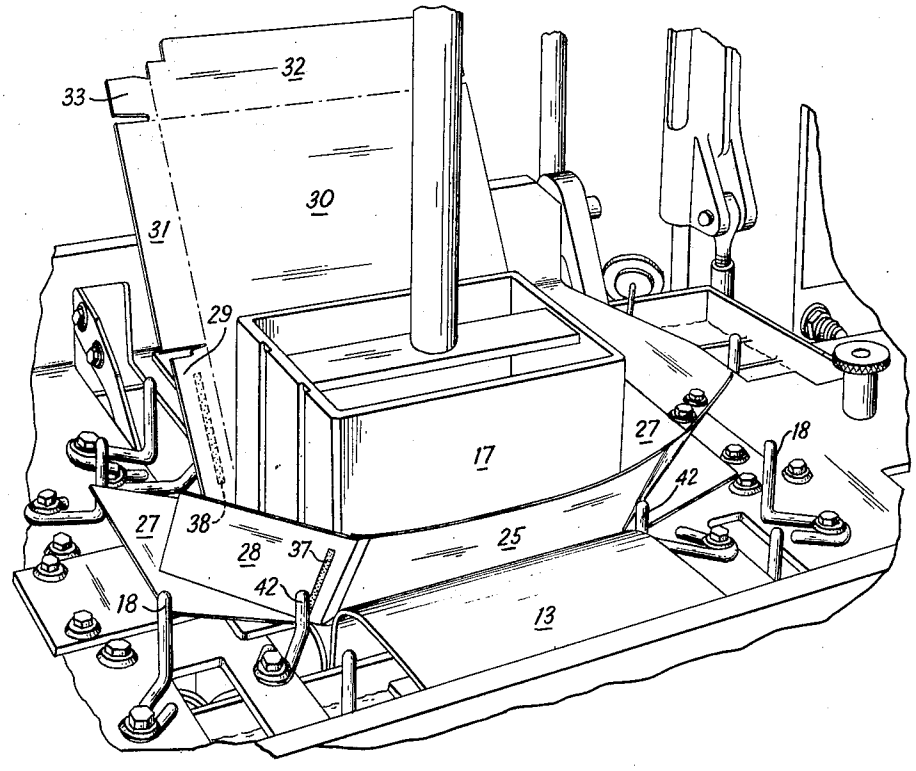
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Primary Examiner—Wayne A. Morse, Jr.
Attorney—Howard G. Russell

ABSTRACT: In the forming of a flat blank into the shape of a glued folding box by pressing the blank through a folding die by means of a plunger, spots of adhesive are daubed on the undersurface of the flat blank at the die mouth by an adhesive applicator which rises from a pool of adhesive. Simultaneously the top surface of the blank is acted upon by a counter element which backs up the blank and moves in a direction opposite to the applicator. The counter element may be mounted on a reciprocating carrier which also carries a suction cup for transporting the blank to the die.



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7 Sheets-Sheet 1

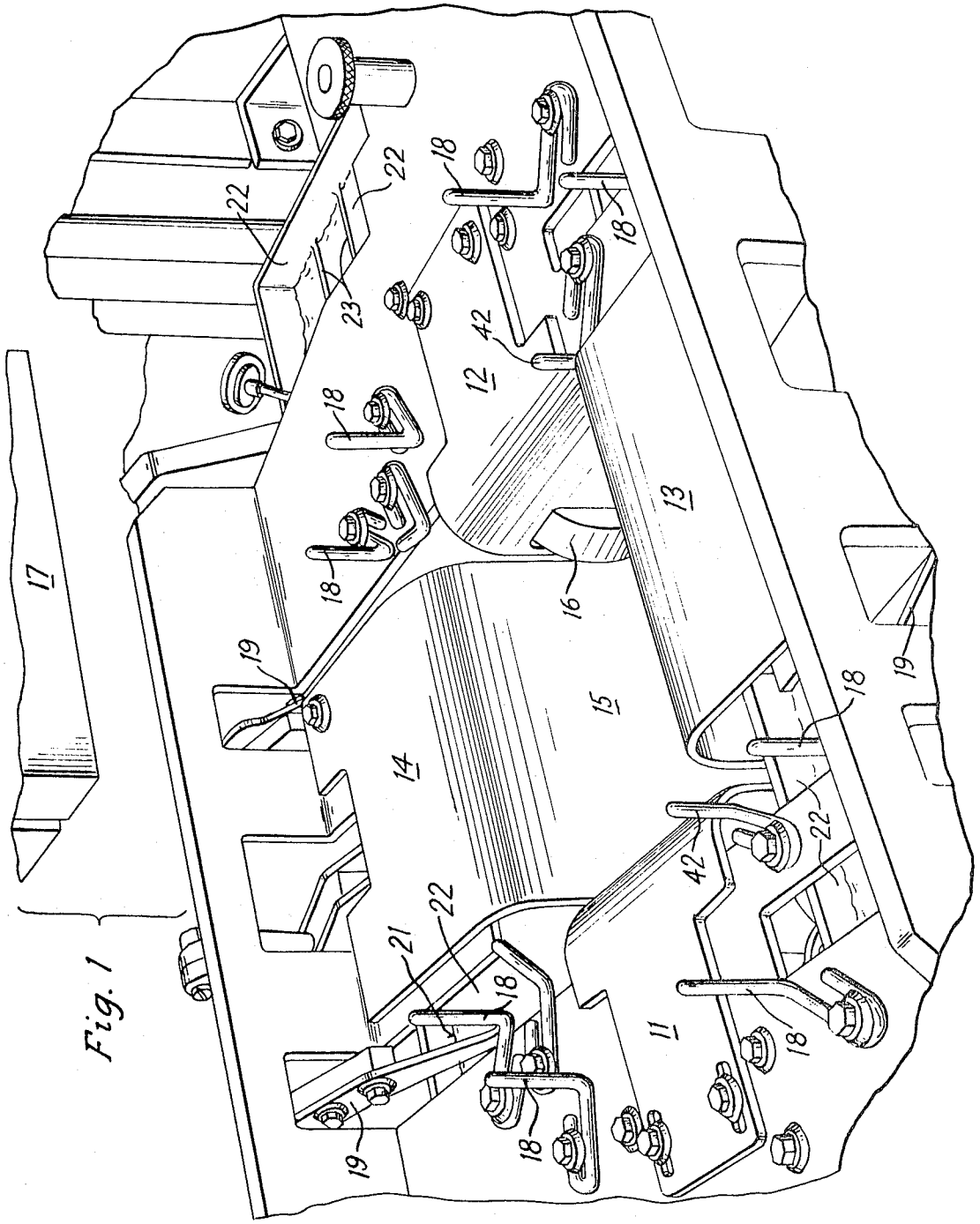


Fig. 1

INVENTOR.
Sigurd J. Hoyrup
BY
Howard G. Russell
his ATTORNEY

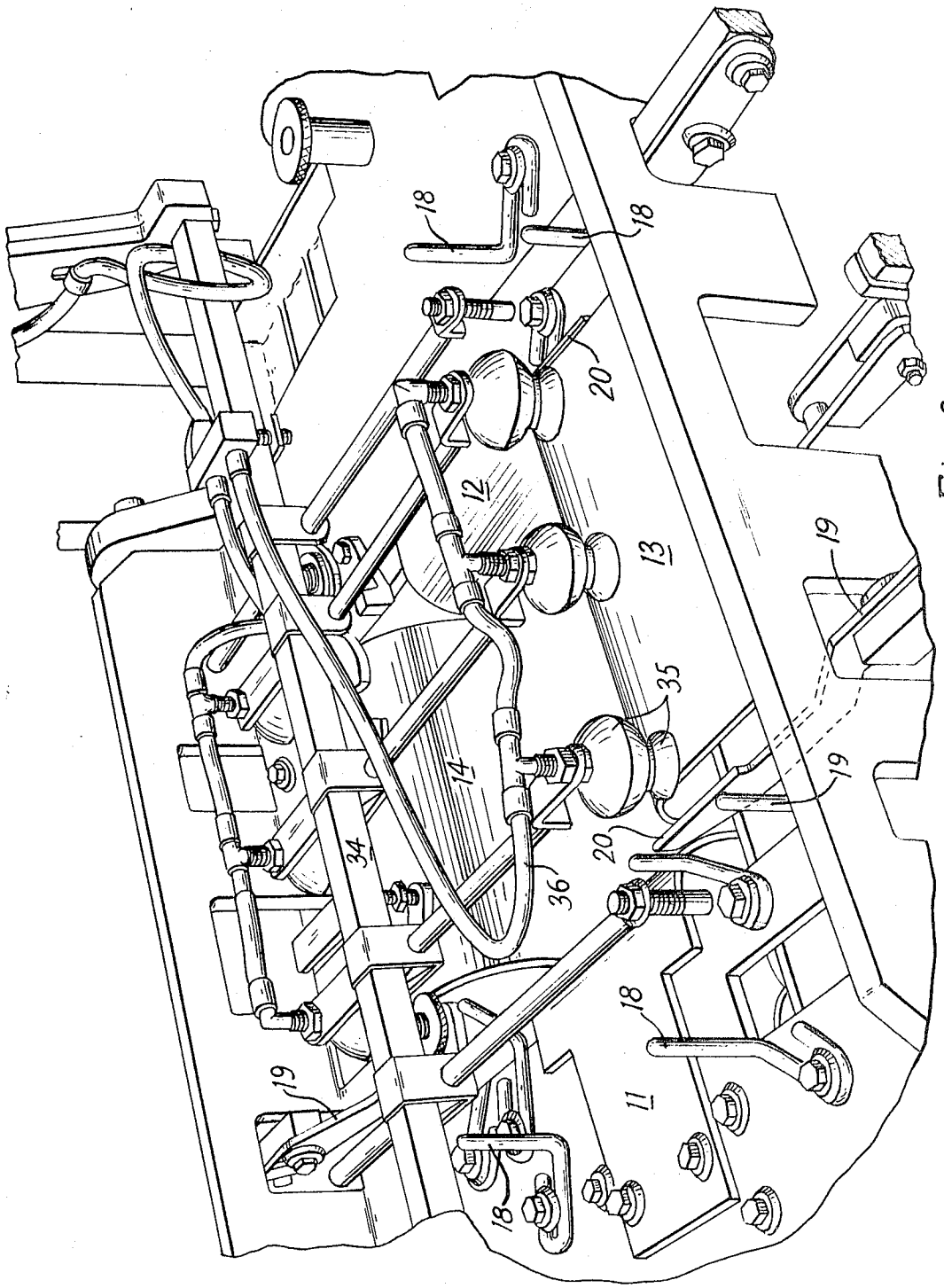


Fig. 2

INVENTOR.
Sigurd J. Hoyrup
BY
Howard b Russell
his ATTORNEY

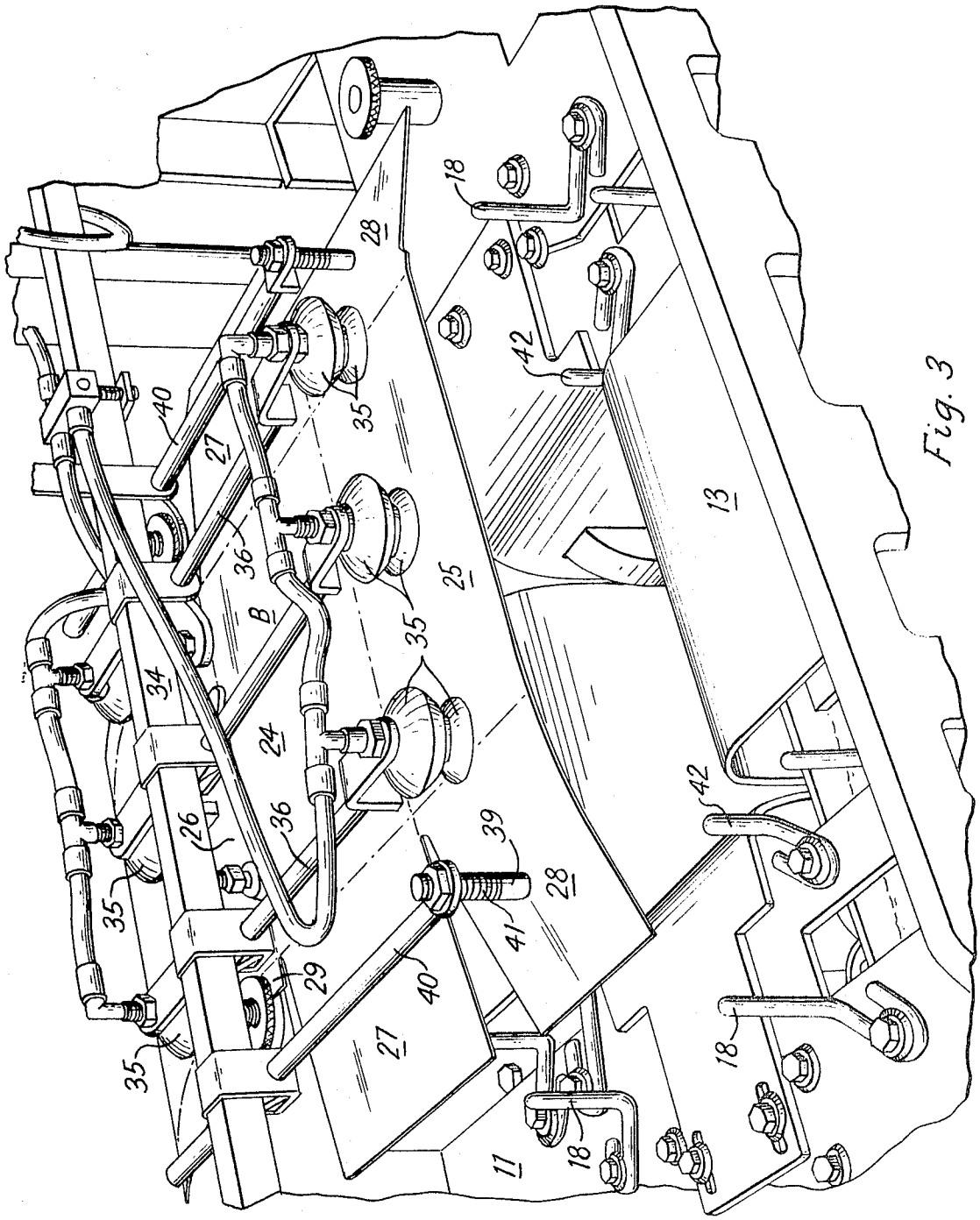


Fig. 3

INVENTOR.
Sigurd J. Hoyrup
BY
Howard G. Russell
his ATTORNEY

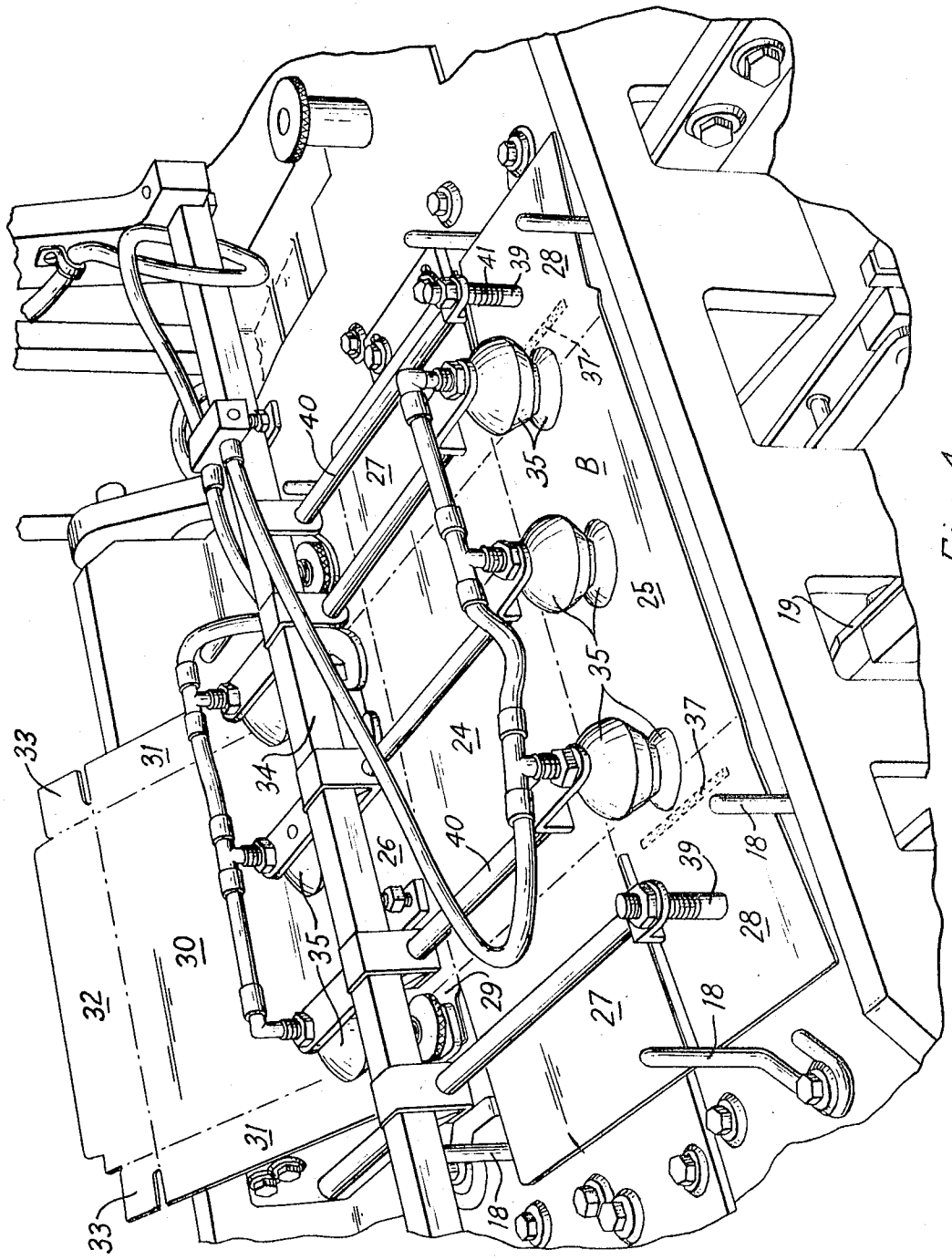


Fig. 4

INVENTOR.
Sigurd J. Hoyrup
BY
Howard G. Russell
his ATTORNEY

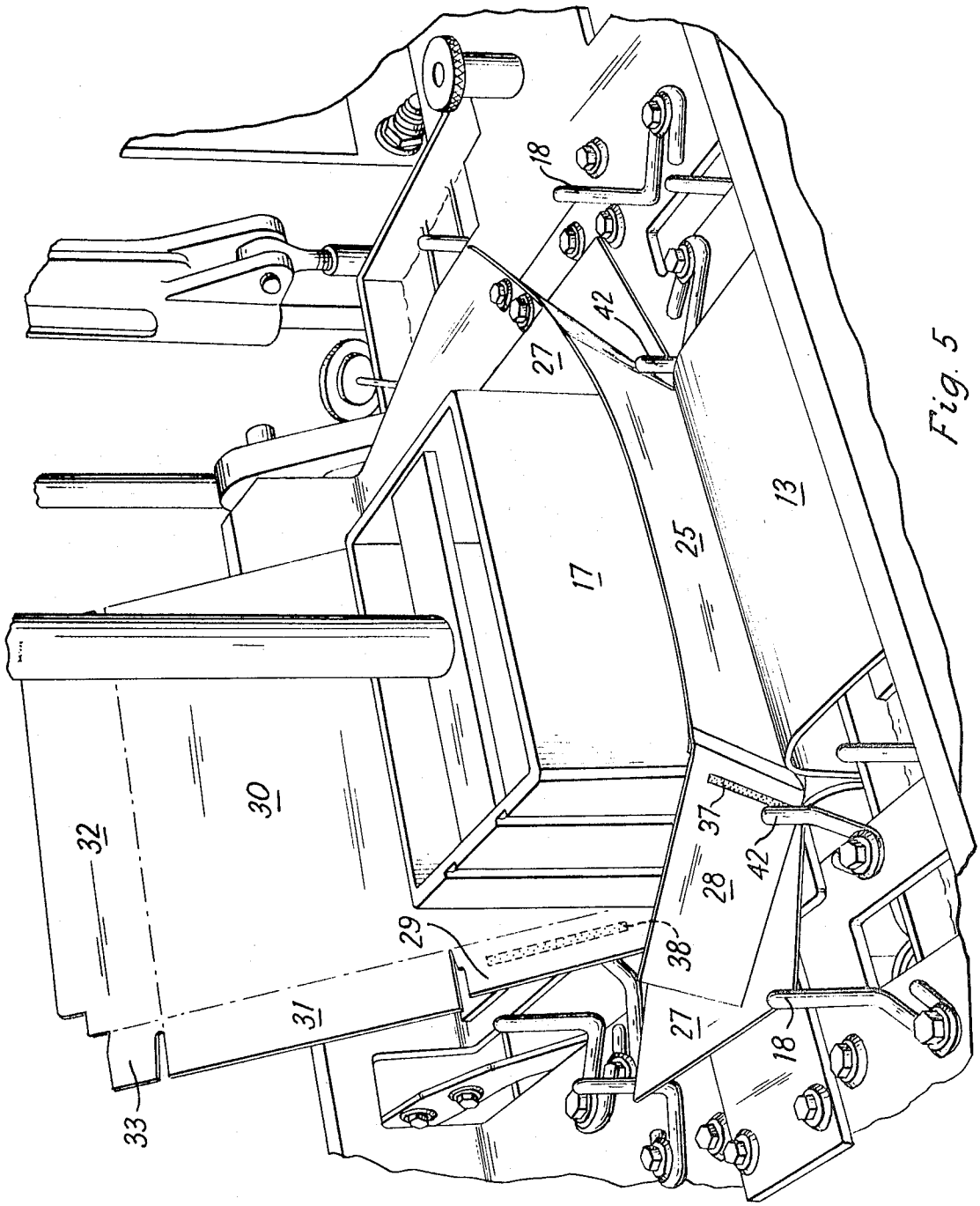


Fig. 5

INVENTOR.
Sigurd J. Hoyrup
BY
Howard G. Russell
his ATTORNEY

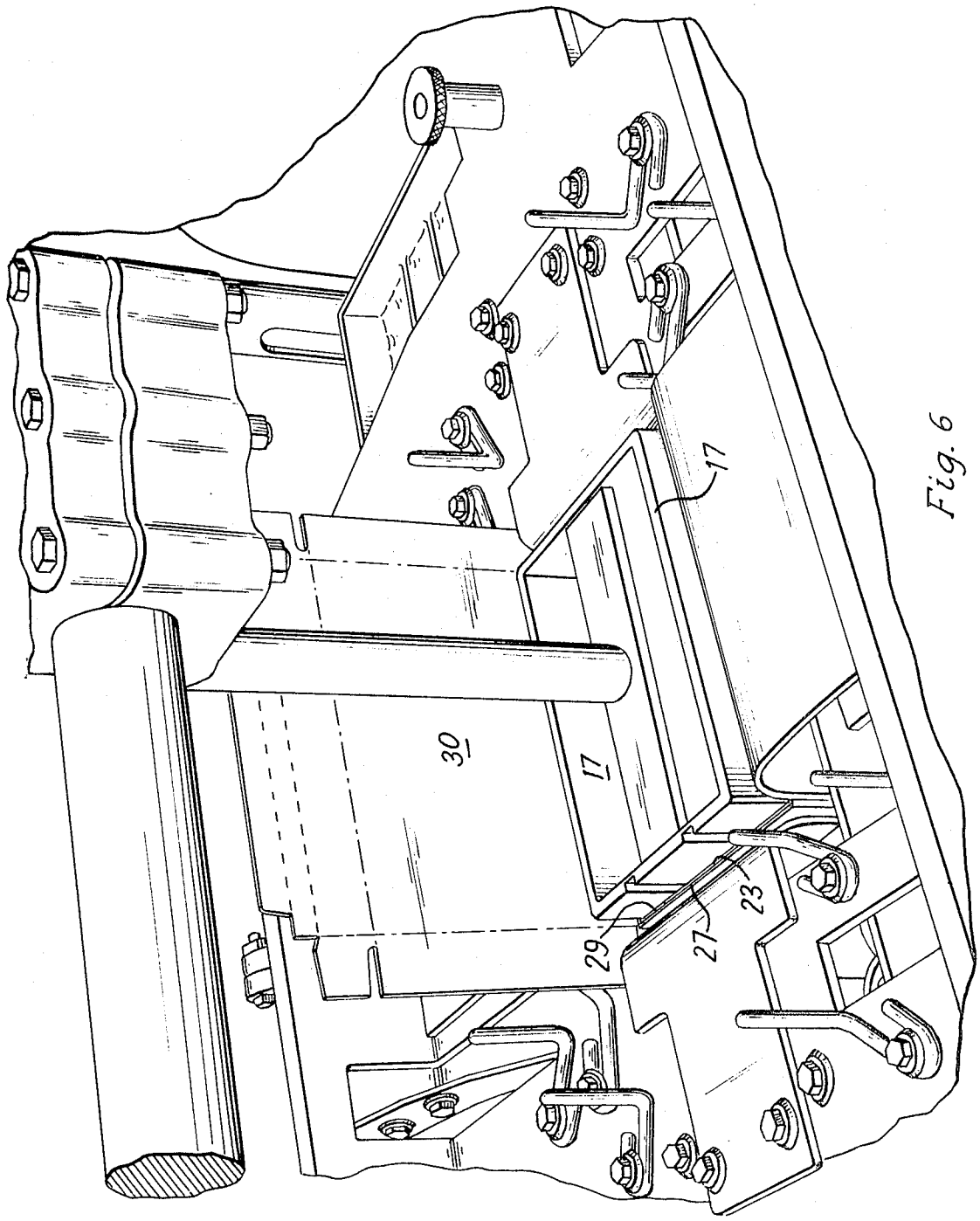


Fig. 6

INVENTOR.
Sigurd J. Hoyrup
BY
Howard S. Russell
ATTORNEY

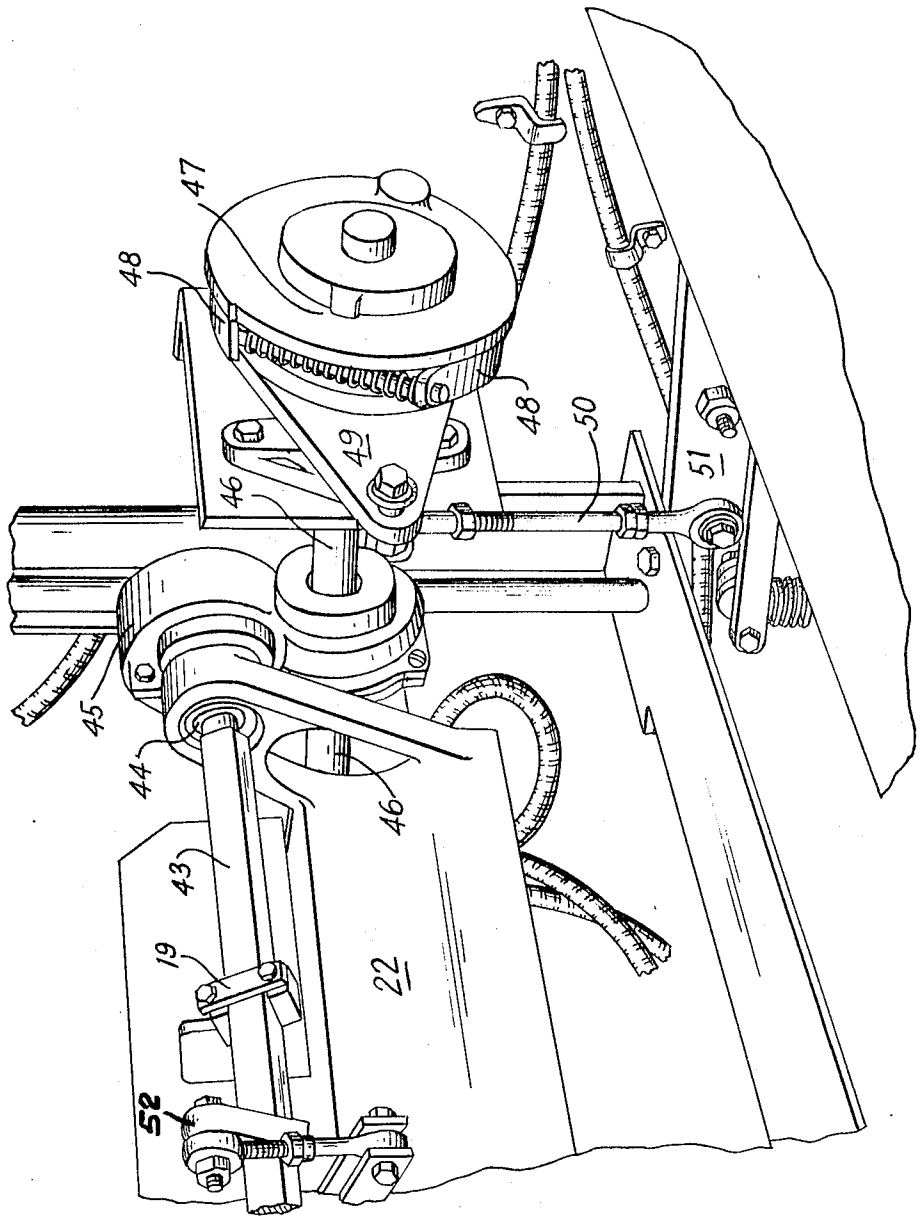


Fig. 7

INVENTOR.
Sigurd J. Hoyrup
BY
Howard B. Russell
his ATTORNEY

DAUBER-TYPE ADHESIVE APPLICATOR FOR FOLDING BOX MACHINES

In the production of glued folding boxes from flat blanks by a plunger-and-die device it is necessary to apply adhesive to corner flaps or wall panel portions of the blank before the plunger drives the blank into the die.

Different forms of adhesive applicators exist for this purpose and the specific form of applicator is generally chosen on the basis of the nature of adhesive used.

Hot melt adhesive is favored because of its brief setting time and its strength. The brief setting time, in turn, dictates application of the glue spots to the paperboard briefly before the respective blank panels are folded into contact.

A form of applicator is known, and is sometimes referred to as a "dauber," in which an applicator element, which is normally submerged below the level of molten adhesive in a reservoir, is raised into contact with the blank to transfer a spot or spots of adhesive carried on its leading portion or face to the board.

Uniform application of adhesive requires that the blank panel to which adhesive is being transferred is maintained consistently is a predetermined position.

In this connection it is known in a folding box closing and sealing machine to maintain a coverside flap at a predetermined angle to the box sidewall while spots of adhesive are being daubed to the underside of the flap. It is also known to place a flap on a horizontal support and apply spots of adhesive to the top surface of the flap by a dauber moving on an arc of about 180°.

Such an arrangement is not suitable for a box forming device of the plunger-and-die type because it would extend into the space required for the reciprocating plunger and for the reciprocating blank transport device operating between a blank pickup station to the deposit station at the mouth of the die.

A considerable amount of space must be kept unobstructed above the die because the transported blank is flat and its box wall and box cover portions extend laterally and longitudinally considerably beyond the bottom area of the plunger.

Depending on numerous factors such as coating, moisture conditions and conditions of previous storage, box blanks are not consistently flat, and laterally extended blank areas are consequently apt to lie at different distances from the top of the die and from adhesive applicators mounted adjacent the die. An applicator rising from a pool of adhesive may meet a warped blank portion too soon, or not at all, depending on whether the blank portion is downwardly or upwardly warped.

This, in turn, causes nonconformity in the application of adhesive spots thereto.

A device for forming a glued folding box from a flat blank, the device comprising a folding die open at both ends, a blank transport device for depositing a flat blank at the mouth of the die, which transport device comprises a carriage, a suction cup mounted on said carriage, and actuating means for moving said carriage in a direction substantially normal to the plane of a blank held by said suction cup, as the carriage approaches the die during the terminal portion of the delivery motion, a plunger for moving through the die a blank deposited at the mouth of the die, and an adhesive dauber for applying a spot of adhesive to the blank at the mouth of the die, the dauber comprising a reservoir of liquid adhesive, an applicator submersible below and raisable above the liquid level in said reservoir sufficiently high, in raised position, to apply a spot of adhesive to the undersurface of the blank, and means for submerging and raising, respectively, said applicator in timed relationship with the transport device, is improved according to this invention by the provision of a counter element mounted on said carriage for bearing against the top surface of the blank during the period of application to the bottom surface of the blank of the adhesive spot.

Blank transport devices comprising a suction cup for grasping the blank and actuating means of a geometry such as to cause deposition of the blank on the die in a direction substantially normal to the plane of the blank are known per se from the prior U.S. Pats. to Baker et al. No. 2,624,249 and Lefief No. 2,805,060.

Advantageously the counter element is mounted on the carriage supporting the suction cup in a position laterally offset with respect to the applicator, so as to cause the blank to be flexed slightly when contacted by the projected applicator.

A particularly advantageous disposition is one in which the path of the applicator lies between the paths of the cup and of the counter element, respectively.

The various features and advantages of this invention will appear more fully from the detailed description which follows accompanied by drawings showing, for the purpose of illustration, a representative preferred embodiment of the invention. The invention also resides in new and original features of construction and combination of elements hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages and the manner in which it may be carried out may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part of the disclosure in which:

FIG. 1 is a perspective view of a forming die and four adhesive applicators submerged in their respective reservoirs;

FIG. 2 is a perspective view of the die of FIG. 1, the applicators having been raised to a position above the liquid level, and a blank feeder and counter member for the applicators having moved in a direction opposite to that of the applicators, the blank being omitted so as not to obscure portions of the mechanism;

FIGS. 3 and 4 are perspective views showing the approach of a flat blank to the die, the position of the various elements in FIG. 4 corresponding to that of FIG. 2;

FIGS. 5 and 6 show the box-forming plunger driving the blank into the die after application of adhesive; and

FIG. 7 is a perspective view from the rear of the box forming die and shows elements of the mechanism for operating the applicators.

In the following description and in the claims various details will be identified by specific names for convenience. The names, however, are intended to be generic in their application. Corresponding reference characters refer to corresponding parts in the several figures of the drawings.

The drawings accompanying and forming part of this specification disclose certain specific details of broader aspects of the invention, but it should be understood that structural details may be modified in various respects without departure from the principles of the invention and that the invention may be incorporated in other structural forms than shown.

The box-forming mechanism shown in FIG. 1 comprises a generally conventional die structure comprising end panel folding elements 11, 12 and front and rear panel folding elements 13, 14. These elements define a substantially rectangular die throat 15 into which four spring-loaded compression rollers 16 project slightly. Only one of these rollers is visible protruding through an appropriate aperture in the folding element 12.

The purpose of the rollers 16 is to exert compressive force on the glue area of a box blank folded about a plunger 17 visible above the die and shown in its action in FIGS. 5 and 6, later to be described.

Locating pins 18 are mounted about the mouth of the die for accurately lining up a flat blank B deposited at the mouth of the die in a manner shown more particularly in FIG. 4, later to be described.

The construction of the plunger and die mechanism described up to this point is known and conventional.

Four adhesive applicators are located approximately at the four corners of the die throat for the purpose of supplying hot melt adhesive to be applied to a blank deposited on the die.

The applicators proper are best seen in FIG. 2 in which they are shown as having the form of vertical blades 19 comprising a substantially horizontally disposed contact face 20. This face is continuous in the illustrated example and capable of daubing a line or bead of adhesive on the undersurface of a blank deposited on the die, but could equally well be serrated, in which case a series of dots of adhesive would be produced.

The applicator blades 19 are shown in raised position in FIG. 2, but are normally retracted and submerged below the level 21 of adhesive contained in reservoirs 22, there being one reservoir for each applicator in the illustrated device. The level 21 is best seen in the left rear reservoir, the shape of the reservoirs, more particularly their exterior walls and their heat conductive ribs 23, being best seen at the right rear applicator assembly in FIG. 1.

In FIG. 1 the applicators 19 are sufficiently lowered to put their contact faces below the level of molten adhesive in the respective reservoirs 22.

Turning to FIGS. 3 and 4, a blank B is shown which is to be folded into box form. The blank comprises a main or bottom panel 24 to which a front wall panel 25 and a rear wall panel 26 are articulated. End wall forming panels are laterally articulated to these wall panels, more particularly an outer end wall panel 27, a major inner end wall panel or corner flap 28 extending from the front wall panel and a minor inner end wall panel or corner flap 29 extending from the rear wall panel 26.

The blank B further comprises panels which form a hinge cover, more particularly a top panel 30 articulated to the rear wall panel 26, side flaps 31, a front flap 32 and corner tabs 33.

In FIG. 3 the blank B is being transported to the mouth of the die by a blank transport device of a construction and geometry disclosed in greater detail in the above mentioned patents.

For the present description it is sufficient to state that the blank transport device comprises a transverse bar 34 to which vacuum cup assemblies 35 are mounted by arms 36, an arrangement which makes the relative location of the cups adjustable for blanks of different form.

The bar 34 oscillates between a blank pickup station, normally a blank magazine, and a blank delivery station, the latter being the die. During the terminal portion of the delivery motion the bar 34 and cups 35 perform a translatory motion, normal to the plane of the blank B, to deposit the box body portion of the blank between the locating pins 18. During the final phase of this transport motion, the cover portion is folded into an angular position with respect to the body portion of the blank (FIG. 4), but this is immaterial for the consideration of the present invention.

In the position shown in FIG. 3 vacuum is applied to the cup assembly and their upper portions are collapsed, thereby flexing the blank slightly. In the position shown in FIG. 4 vacuum is relieved, the cup assemblies relaxed and the body portion of the blank is flat.

In this position the blank rests on or near the mouth of the die, more particularly on the horizontal portions of the end and front panel folding elements 11, 12 and 13.

A comparison of FIG. 4 with FIG. 2 shows that the applicators 19 are extended, thereby daubing a pattern of adhesive 37, 38 on the underside of the blank (see also FIG. 8 for the adhesive deposit 38) on the panel 29. The action of the applicators causes slight lifting of the blank.

In order to insure a precise disposition of the panels to which adhesive is to be applied, counter elements 39 bear down on the blank from the top. These counter elements suitably have the form of pins or studs 39 and move in a direction opposite to the direction of the applicators 19.

As the transverse bar 34 of the blank transport device performs such a motion at just the proper time, the counter elements 39 are suitably mounted on the bar by arms 40 affording adjustability. The pins or studs 39 are threaded at 41 and screwed into heads on the arms, thus permitting up and down adjustment with respect to the blank.

Suitably the points at which the counter elements bear down on the blank are laterally offset with respect to the applicators 19. More particularly, the paths of the cups 35 and counter elements 39 may straddle the path of the applicator 19 (as shown clearly in FIG. 2 in which the blank is omitted).

After daubing of adhesive to areas 37, 38 the blank transport device and counter elements 39 move away in an upward direction, and the applicators move away in a downward direction for resubmersion in the respective adhesive reservoirs.

The plunger 17 descends, seats on the bottom panel 24, and forces the blank into and through the die.

During this operation folding elements 42 cause the major and minor end panels 28 and 29 to be folded towards the end surfaces of the blank (FIG. 5). The end panels 27 are then folded thereover and adhere to the adhesive deposits 37, 38 (FIG. 6).

The box body portion is now folded about the plunger 17 and passes through the die throat where the rollers 16 (FIG. 1) apply compressive force to the glued areas.

The formed box (with its cover still flat) is then ejected from the bottom of the die in a known manner.

FIG. 7 shows a portion of the actuating mechanism of the adhesive applicators as viewed from the rear of the machine.

The applicator 19 is mounted on a square shaft 43 supported in a bearing 44 and extending into a spiral gear housing 45. The housing contains spiral gears of a right-angle drive. The driving shaft 46 (which also extends towards the front of the machine where a similar square shaft and right-angle drive is provided) carries a coupling disc 47 on its rear end. The disc periphery is engaged by a clamp or band 48 on a lever 49 from which a link 50 extends to an oscillating arm 51 of the drive mechanism of the machine which moves the plunger and the blank transport device. As the arm 51 oscillates or rocks up and down, the square shafts 43 are caused to oscillate about their axes to raise and lower the adhesive applicators 19.

The clutch assembly 47 to 49 permits the moment of adhesive application to be timed relatively to the movements of the blank transport device, counter element and plunger.

A further lever 52 on the square shaft 43 actuates an adhesive pump (not shown) which pumps adhesive into the reservoirs so as to maintain a predetermined liquid level therein.

Manifestly the adhesive daubed on the blank need not be of the hot melt type, but may be liquid adhesive which sets by evaporation or absorption of its solvent into the board.

I claim:

1. In a device for forming a glued folding box from a flat blank, the device comprising a folding die open at both ends; a blank transport device including a carriage, a collapsible suction cup mounted on said carriage, and vacuum duct means for applying vacuum to, and relieving vacuum at, said cup, the mouth of said suction cup being in retracted position when said cup is collapsed under vacuum and being in an extended position when vacuum is relieved, and actuating means for moving said carriage in a direction substantially normal to the plane of a blank held by said suction cup, as the carriage approaches the die during its terminal portion of the delivery motion; a plunger for moving through the die a blank deposited at the entrance of the die; and an adhesive dauber for applying a spot of adhesive to the blank at the mouth of the die, the dauber comprising a reservoir of liquid adhesive, an applicator submersible below and raisable above the liquid level in said reservoir sufficiently high, in raised position, to apply a spot of adhesive to the undersurface of the blank, and means for submerging and raising, respectively, said applicator in timed relationship with said transport device, the improvement consisting in the provision of a counter element mounted on, and movable with, said carriage for bearing against, and engaging, the top surface of the blank during the period of adhesive application to the bottom surface of the blank, the blank engaging portion of the counter element being positioned substantially in the plane of the mouth of the suction cup in extended condition and being in advance of the

mouth, considering the cup in collapsed condition, said engaging portion being in a position laterally offset with respect to said applicator, so as to cause the blank to flex when contacted by the applicator in its raised position.

2. A device according to claim 1 in which the counter element is mounted on said carriage in a position laterally spaced with respect to both said suction cup and said applicator, such that the path of motion of the applicator lies between the path of motion of the cup and the path of motion of the counter element.

3. A device for forming a glued folding box from a flat blank comprising wall panels and flaps articulated to certain wall panels, the device comprising, in combination, a folding die open at both ends; a blank transport device comprising a carrier, a suction cup on said carrier in a position to grasp at least one of such blank panels, and operating means for reciprocating said carrier between a blank pickup station at which said cup grasps the blank and a deposit station at the entrance of the die, toward which entrance said operating means moves said carrier and blank by a motion substantially normal to the plane of a blank held by said cup, a plunger movable in timed relationship to said transport device for moving through the die a blank deposited at the die; a reservoir for liquid adhesive adjacent the die, an applicator submersible below the level of adhesive in said reservoir and raisable above the liquid level to contact, and daub at the deposit station, a quantity of adhesive to the undersurface of a flap of the blank articulated to said cup-held panel; means for raising and lowering said applicator in timed relationship with said transport device, and a counter element mounted on said carrier in a position laterally spaced with respect to said applicator, said counter element comprising a blank engaging portion positioned substantially in the plane of the mouth of the suction cup, considering said mouth in the condition of a blank being sucked thereagainst, said counter element bearing down on the upper surface of said flap during the period the applicator contacts the lower surface of said flap and at a point sufficiently far from the line of articulation of the flap to cause said flap to flex at the point of engagement by said applicator.

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