April 6, 1965 L. TRIOLO 3,176,596

ENVELOPE MAKING MACHINE

Filed April 3, 1963 4 Sheets-Sheet 1

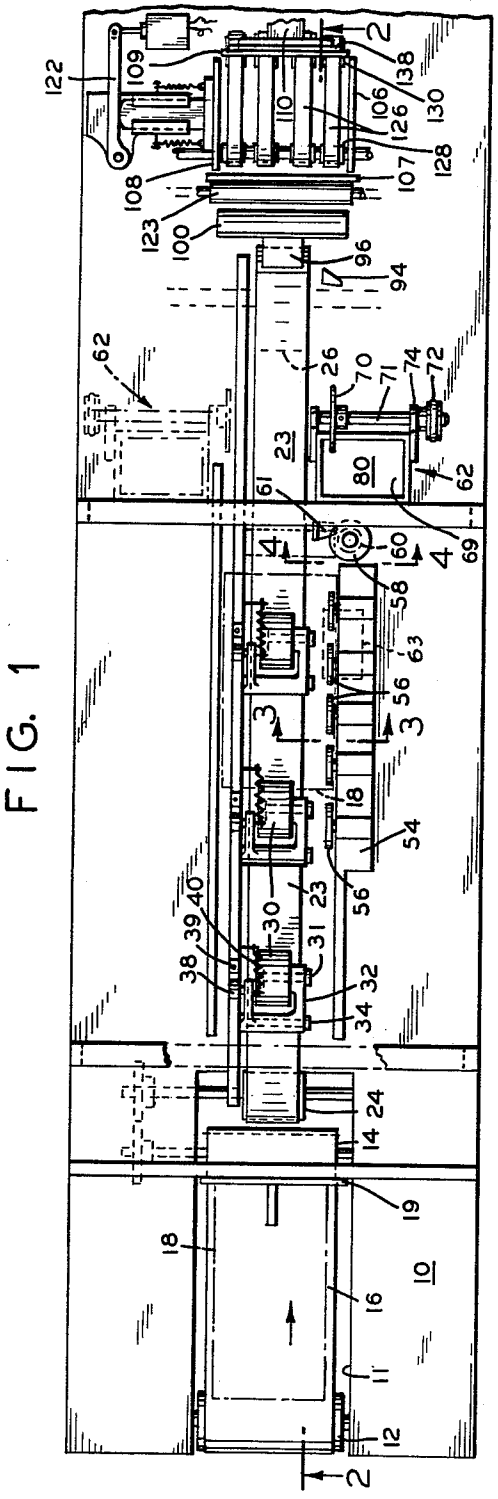


FIG. 1

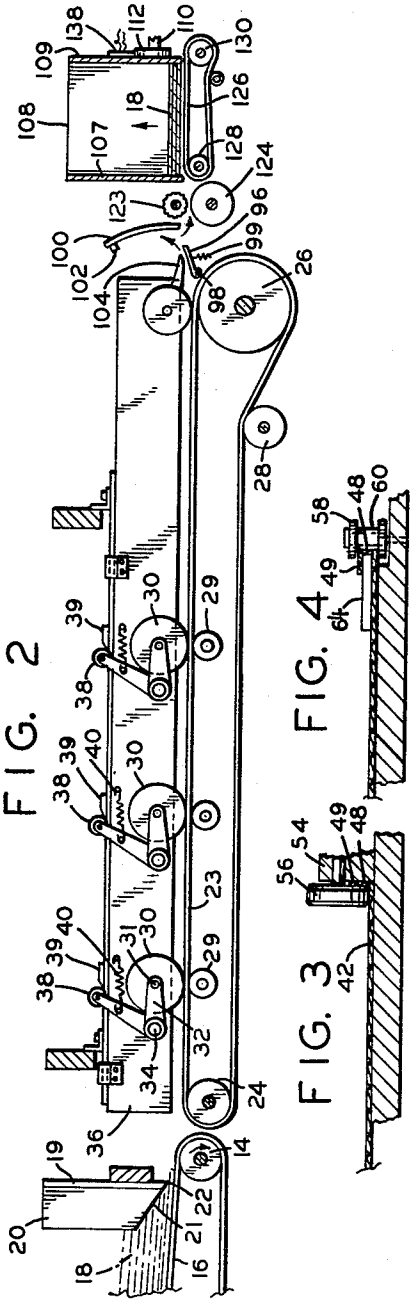


FIG. 2

FIG. 3

FIG. 4

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FIG. 5

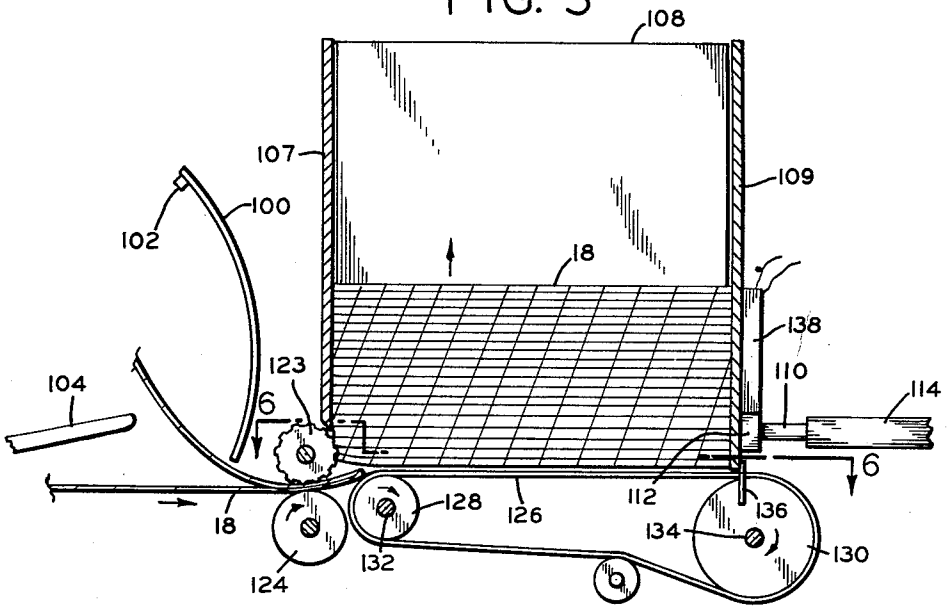
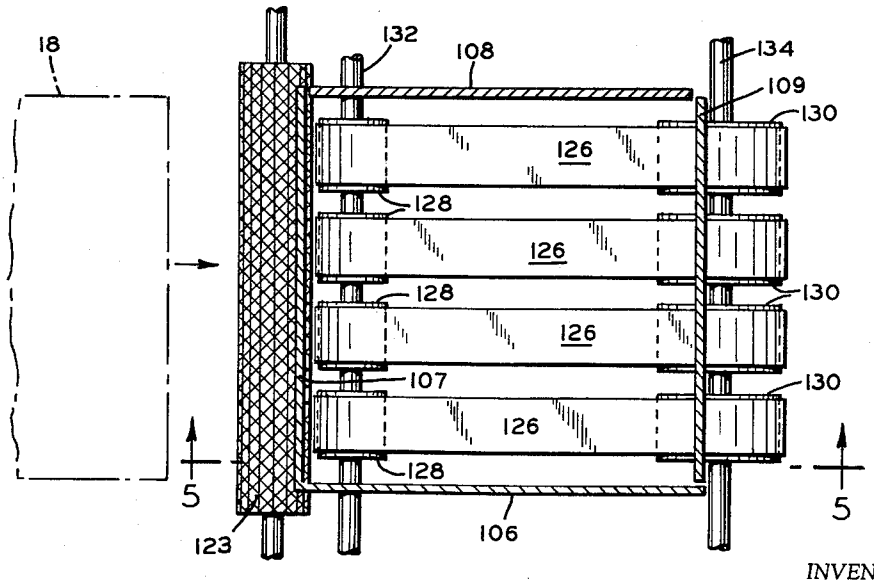


FIG. 6



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FIG. 7

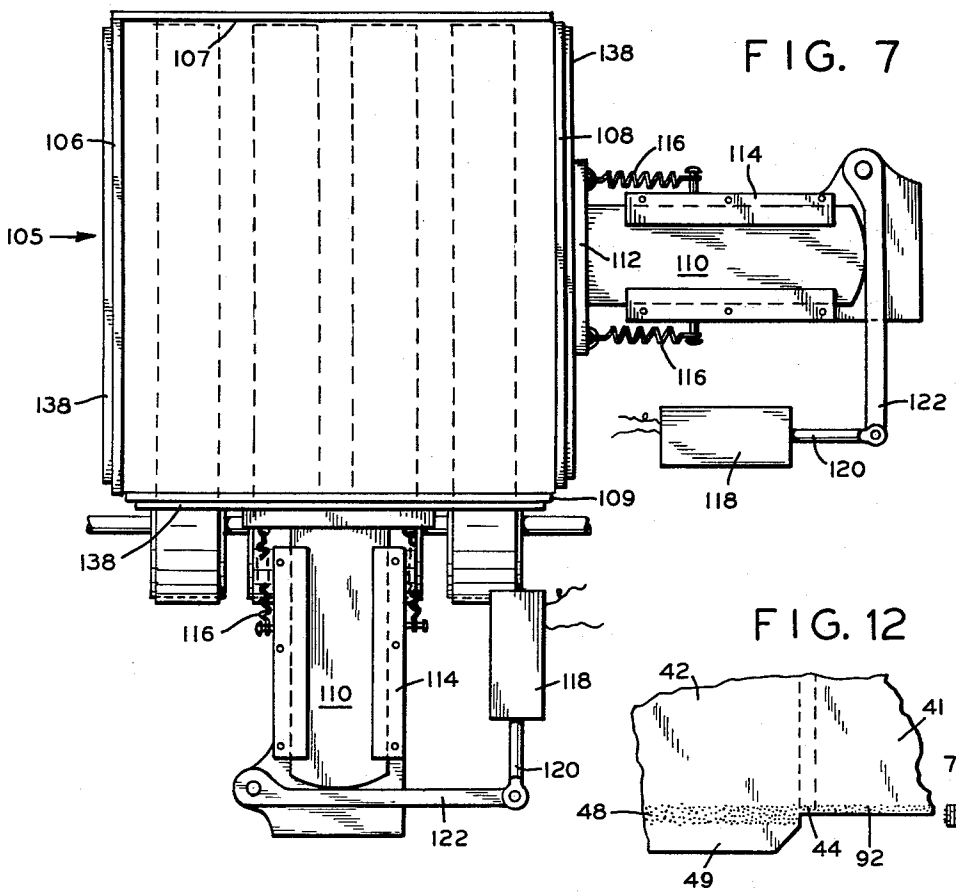


FIG. 12

FIG. 8

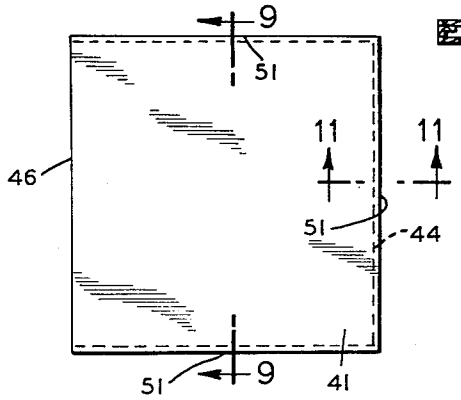


FIG. 9

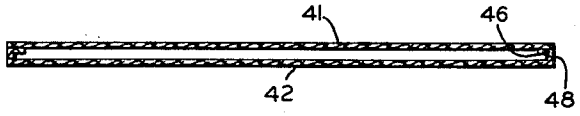


FIG. 11

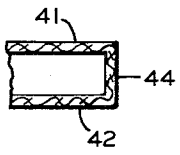
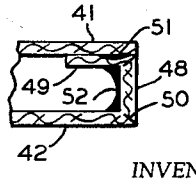


FIG. 10



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FIG. 13

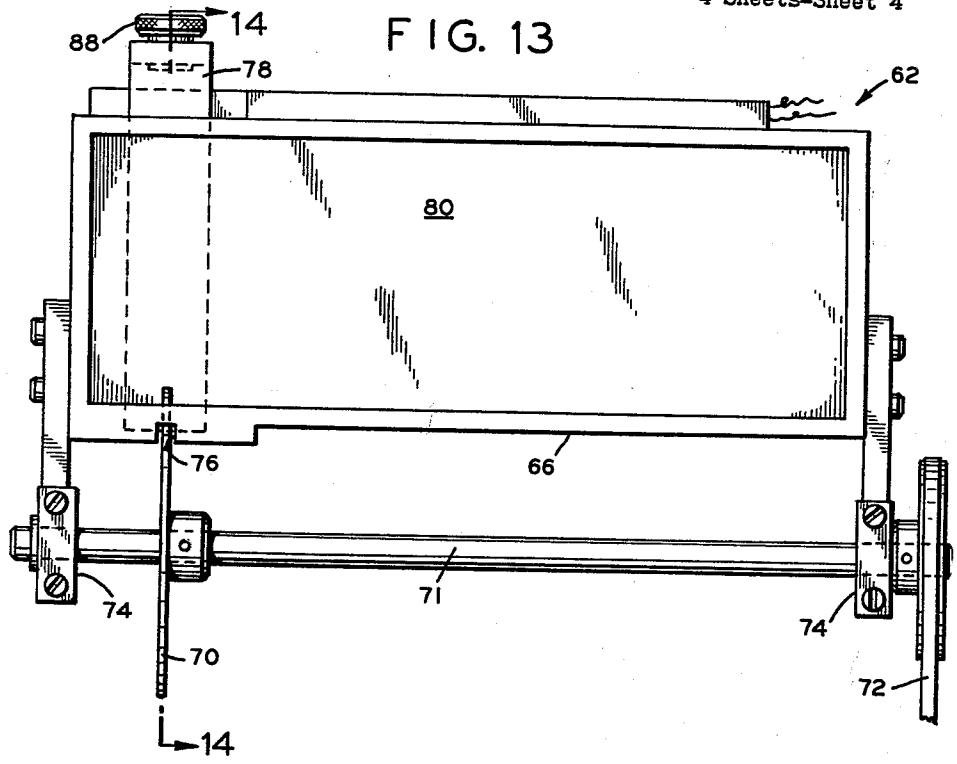


FIG. 14

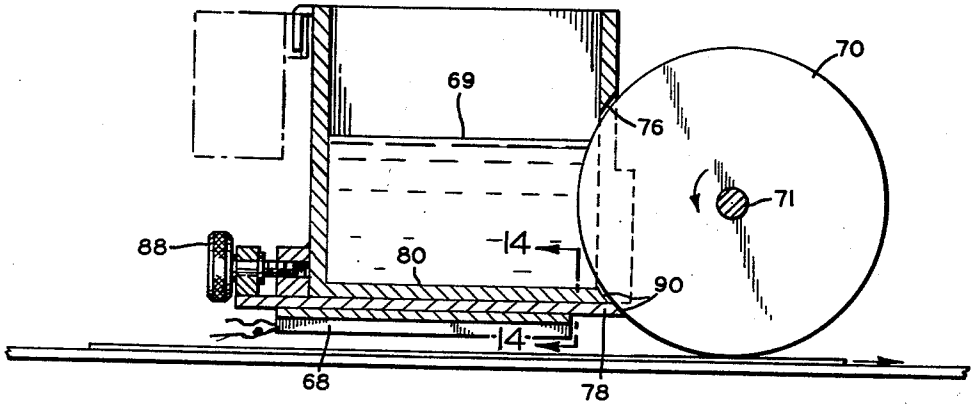
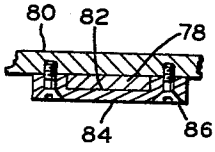


FIG. 15



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3,176,596

Patented Apr. 6, 1965

3,176,596

ENVELOPE MAKING MACHINE

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Filed Apr. 3, 1963, Ser. No. 270,435
11 Claims. (Cl. 93—49)

This invention relates to envelope forming machines and relates more particularly to an improved high speed machine for making envelopes for housing flat articles such as phonograph records.

A novel record envelope is illustrated in my co-pending application Ser. No. 257,130, now abandoned wherein there is formed a cavity of the approximate thickness of the record and this facilitates ease of insertion and removal of the record. Equally important in this envelope is the fact that corners along the three closed edges have a right angular formation which adds to the attractiveness of the envelope. Record envelopes having right angular corners along three sides and a cavity of approved depth are not new and they usually have inserted reinforcing strips which, however, increase the dimensions from those of the standard envelope. Moreover, they cannot be manufactured by high speed machinery.

An important object of the present invention is to provide a machine which forms the side or vertical walls, usually about ⅛ inch in height, with neat right angular corners and the blank is continuously moving at high speed from the time it is fed from the bottom of a stack at one end of the machine until it emerges at the other end as a completed envelope, ready for application of the wrapper and label. This latter operation may be done by any suitable wrapping machine.

Another object of the invention is to provide a machine which forms vertical or side walls with neat right angular corners and without internal mandrels which heretofore have always been necessary for such an operation. This latter is accomplished by first folding the blank along cutscore lines or perforated lines to form the side walls, then opening the blank to flat condition and then applying hot, fast drying thermoplastic glue as the blank travels downstream, then refolding the blank and feeding it to the bottom of a stack of envelopes in presser type of hopper wherein the pressure on the adhesive flaps is effected by the weight of the envelopes and the side walls are straightened up to a vertical position by means of two adjacent vibrating side walls of the hopper, the two remaining side walls being fixed.

When the thermoplastic glue is first applied to the appropriate area of the creased but now flat blank, which has been heated, it then promptly cools and loses its tackiness. The flaps are again folded inwardly and the folded blank is fed by a belt conveyor to the bottom of the stack. The flaps at this stage are trying to regain their initially flat condition. The vibrating action of the two adjacent walls of the hopper working against the side wall sections of the flaps and against the side wall opposite the open side, move these side walls to a vertical position and heating elements in the side walls of the hopper reactivate the glue. The heating elements extend part way up these side walls and as the stack is fed upwardly the glued flaps eventually leave the heated zone and enter an unheated zone, causing the adhesive to set while the side walls are vertical and the glue flaps are in proper position for adhesion. The weight of the upper end of the stack is sufficient to secure effective adhesive without crushing the side walls and the operation is effected without an internal mandrel which would slow down operation to a crawl.

It will be apparent from the foregoing that another object of the invention is to provide an improved method of forming boxes with vertical side walls without the aid

of an internal mandrel to support the side walls while the flaps are being adhered to on upper or lower horizontal wall.

In the drawings:

FIG. 1 is a plan view of a machine embodying the invention.

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1.

FIG. 3 is a broken section showing one means for folding the combined side wall and glue flap upwardly as the blank is moved by the conveyor.

FIG. 4 is a broken section showing the means for folding the glue flap portion downwardly to a horizontal position.

FIG. 5 is a sectional elevation taken along line 5—5 of FIG. 6 and shows the presser type of hopper with its feed to the bottom of the stack.

FIG. 6 is a sectional view taken along line 6—6 of FIG. 5.

FIG. 7 is a plan view of the end of the hopper with its two fixed and two vibrating or reciprocating walls.

FIG. 8 is a plan view of the record envelope.

FIG. 9 is a view taken along line 9—9 of FIG. 8.

FIG. 10 is an enlarged view of one end of FIG. 9 showing the detail.

FIG. 11 is a section taken along line 11—11 of FIG. 8.

FIG. 12 is a broken plan view of a portion of the open blank with adhesive applied thereto.

FIG. 13 is a plan view of a glue applicator as used in the present invention.

FIG. 14 is a sectional elevation taken along line 14—14 of FIG. 13.

FIG. 15 is a sectional view taken along line 15—15 of FIG. 14.

The blank folding and glue applying assembly is shown in FIGS. 1 to 4 and the blanks move from left to right. The assembly includes an elongated platen 10 with a slot 11 at its upstream end to receive a pair of spaced rotating drums 12 and 14 on which an endless conveyor belt 16 is mounted. A stack of the unfolded blanks 18 are supported on this belt. A gate 19 for the blanks has a rearward extension 20 with an inclined lower edge 21 parallel with the line of travel of the blank and also a transverse lower edge 22 which is spaced above the conveyor belt just enough to permit one blank to pass through at a time.

After passing forward drum 14, the flat blank is fed to a second endless conveyor belt 23 mounted at opposite ends on drums 24 and 26, the belt also engaging an idler 28 and three supporting rollers 29 for the top flight of the endless belt 22. The top faces of the blanks are engaged by idler rollers 30 journalled at 31 on generally L-shaped frames 32 pivoted at 34 on a fixed plate 36 supported above the top flight of conveyor belt 23. A roller 38 on an upward extension of the frame engages a stop 39 on the upper edge of plate 36. A spring 40 urges the roller 30 downwardly to move the blank into driving relation with conveyor belt 23. Drums 12–14 and 24–26 are driven by suitable means (not shown) but the remaining rollers need not be driven.

At this point, reference is made to the finished envelope, minus the usual wrapper or label, shown in FIGS. 8 to 12. It includes an upper wall 41 and a lower wall 42 formed from a single blank and joined by a shallow end wall 44 opposite the open side 46 of the envelope. The envelope is closed along the two remaining sides by means of side walls 48 having margins 49 which are adhesively joined to the lower marginal edges of upper wall 41.

In order to obtain right angular corners, the edges which are bent to form such corners are cut-scored or perforated at 50 over major portion of their lengths, leaving a short central section 51 of about two inches in

length which is merely creased in order to avoid any weakening of the attachment of this central section to the upper and lower walls. These central sections are engaged by the outer periphery of the record. The central portions of these three edges which are creased merely and are not cut-scored do not have the neat, sharp right angular corners as do the remaining sections but these central sections are relatively short and are not noticed.

As will be pointed out more in detail, adhesive 52 is employed to adhere the margin 49 of the flap to the upper wall and the inner face of side wall 48 also has an adhesive coating 52 to increase its strength.

The section of the blank forming upper wall 41 of the envelope is the leading edge of the blank and it is fed from conveyor 16 to conveyor 23.

The first folding operation is shown in FIG. 3 and it consists in folding upwardly the combined side wall and flaps 48 and 49 to a vertical position. This may be accomplished by conventional means and as shown it consists in having the edges contact a fixed mandrel 54 having an initial curved surface (not shown) and in folding the opposed edges upwardly against wheels 56 which have a rolling action as the blank passes downstream. The next step is to fold margin 49 downwardly and this is conventionally accomplished by means of a forming wheel 58 having a recess 60 which performs the operation as shown in FIG. 4 by pressing side wall 48 and flap 49 against a fixed mandrel 64 which may be carried by fixed plate 36. It is preferred to mount the mandrel with a small amount of lateral movement. A cam finger 61 now opens the edge on each side of the blank to a relatively flat position for application of the adhesive. The folding elements shown on one side of fixed plate 36 are, of course, duplicated on the other side thereof.

The application 62 is shown in FIGS. 13, 14 and 15 and one of these applicators is positioned on each side of the machine. The adhesive used is of the hot melt or thermoplastic type which remains tacky so long as the board to which it is applied is itself hot. In this case the opposite sides of the blank are heated by electric heaters 63 on the lower face of platen 10. A reservoir 66 has a heating element 68 on its lower surface and the adhesive shown at 69 is applied to the periphery of a thin applicator wheel 70 carried on a shaft 71 which is drive by a belt 72. The shaft is mounted in bearings 74. The forward wall of the reservoir has a slot 76 within which the rear edge of the wheel is positioned, in contact with the fluid adhesive. The amount of adhesive applied to the wheel is varied by means of a sliding plate 78 which is slidable in close relation to the bottom wall 80 of the reservoir. This plate 78 moves in a slot 82 in a slideway 84 secured by screws 86 to this bottom wall 80. Adjustment is effected by a knurled finger wheel 88.

The forward edges of lower reservoir wall 80 and plate 78 are beveled at 90 to fit the contour of applicator wheel 70.

As the blank, whose flaps 48–49 have been unfolded by finger 61, pass under adhesive applicator wheel 70 the adhesive is applied to forward blank section 41 (FIG. 12) along the margins shown at 92 and also to side walls 48.

Leaving the adhesive applicator, the opposed margins are again folded inwardly by means of cam fingers 94 and the blank contacts a curved plate 96 hinged at 98 and urged upwardly by spring 99. The leading edge of the blank now contacts a curved baffle plate 100 having a stop 102 and is directed towards this plate by a finger 104. As soon as this leading edge moves upwardly and contacts the stop 102, spring loaded plate 96 moves downwardly, due to the weight of the blank, automatically folding the blank in the center. Since score lines are cut to an equal depth along each side of side wall 44 an equal amount of bending occurs along each of the lines.

The folded blank is now fed to the bottom of the stack of folded envelopes in a square hopper 105 with its side wall tampers in the following manner.

This hopper has two adjoining fixed walls 106 and 107 and two inwardly movable walls 108 and 109 which have a vibratory or reciprocating action. This vibration is imparted to these walls by a slide 110 affixed to a plate 112 carried by each movable wall. The slide moves in fixed channels 114 and springs 116 urge the slide outwardly. A solenoid 118 receives an armature 120 pivoted to an arm 122 which engages the slide.

After the blank has been folded in the center as earlier described, it is still being fed downstream and as hinged plate 96 drops the folded blank is at the point indicated by the arrow in FIG. 2 and is then picked up by a knurled roller 123 and a smooth roller 124. The right hand edge of the knurled roller is flush with the inner face of fixed wall 107 (FIG. 5). The blank is thus delivered to conveyor belts 126 mounted between drums 128 and 130 carried on shafts 132 and 134. Four of these conveyor belts are shown.

It will be noted that rollers 128 are close to feed roller 123–124 and that there is an area at the left hand side of the stack where the folded blanks are unsupported. This area is where the leading edge of the folded blank is fed and is picked up by conveyor belts 126 and delivered to the right until it contacts wall 109 which acts as a stop. This wall has fingers 136 which extend down between the conveyor belts.

The open side of the envelope contacts fixed wall 107 of the hopper and as wall 109 reciprocates it hits side wall 44, retaining it in a vertical position. It was earlier pointed out that side walls 48 and glue flaps 49 having been creased for the first time only moments earlier, try to regain their initial flat condition and they are kept vertical at all times due to the vibratory assembly in wall 108. They are well set up by the time they first feel the influence of heaters 138 which are affixed to each of walls 107, 108 and 109. Wall 107, of course, does not require a heater. These heaters re-activate the thermoplastic adhesive which does not set, however, until the envelopes move above heaters 138 and enter the cool zone.

While there have been described herein what are at present considered preferred embodiments of the invention, it will be obvious to those skilled in the art that many modifications and changes may be made therein without departing from the essence of the invention. It is therefore to be understood that the exemplary embodiments are illustrative and not restrictive of the invention, the scope of which is defined in the appended claims, and that all modifications that come within the meaning and range of equivalency of the claims are intended to be included therein.

What I claim is:

1. A machine for making rectangular envelopes with one open edge and formed from blanks provided with shallow side walls, at least two of which have attached glue flaps, said machine including a frame, a conveyor for moving the blanks, means for folding the side walls with attached flaps inwardly, means for applying glue to portions of the blanks where the flaps engage a horizontal wall, a rectangular hopper formed with four walls, at least two of said walls which are movable inwardly towards said side walls of the envelope, means for imparting reciprocating movement to the movable walls, a conveyor at the bottom of the hopper on which the assembled blanks rest, means for folding the side walls of the blanks and for feeding the blanks with superimposed walls to the bottom of the stack on said conveyor, and heating means attached to at least two of said side walls for reactivating the adhesive after which pressure from the upper envelopes of the stack secures the adhesive portions of the lower envelopes together.

2. A machine for making square envelopes with one open edge and formed from a single center-folded blank and provided with shallow side walls, two of which have attached glue flaps, said machine including a frame, a conveyor for feeding the blanks, means for folding the

side walls with said attached flaps inwardly, means for applying thermoplastic glue to portions of the blank to be engaged by the flaps, a square hopper formed with two adjoining fixed walls and two remaining walls which are movable inwardly towards said side walls of the envelope, means for imparting reciprocating movement to said latter walls, a conveyor at the bottom of the hopper on which the folded blanks rest, means for folding the glued blank and for feeding it to the bottom of the stack supported on said conveyor, and heating means attached to at least two of said side walls for reactivating the adhesive after which pressure from the upper envelope of the stack secures the adhesive portions of the lower envelopes together.

3. The structure defined in claim 2 wherein the glue applying means also applies glue to the side walls attached to the flaps to reinforce and stiffen said side walls.

4. The structure defined in claim 2 wherein the glue applying means includes a heated reservoir having a vertical side wall slot and an applicator wheel extending through said slot for applying a glue strip to the blank.

5. The structure defined in claim 4 wherein an adjustable plate engages the applicator wheel to vary the amount of glue applied to the blank.

6. In an apparatus of the type described, a hopper having two adjoining fixed walls and two remaining walls which are movable towards and away from said vertical side walls, means for imparting rapid reciprocating movement to said movable side walls, conveyor means for feeding envelopes to the bottom of a stack of envelopes in said hopper, and heating means attached to the lower ends of at least two of said hopper walls.

7. A hopper for receiving rectangular envelopes formed with shallow vertical side walls, some of which carry flaps with a non-tacky thermoplastic glue thereon, to be adhered to a horizontal wall of the envelope while the side walls are maintained in a vertical position, said hopper having two adjoining fixed walls and two remaining walls which are movable towards and away from said vertical side walls, means for imparting rapid reciprocating movement to said movable side walls, conveyor means for feeding the folded envelopes to the bottom of a stack of envelopes in said hopper, heating means on the lower ends of at least two of said hopper walls to reactivate the adhesive while the side walls are maintained in a vertical position due to said reciprocating movement, the weight of the envelopes above the heating zone furnishing sufficient pressure to adhere the flaps to said horizontal wall.

8. The structure defined in claim 7 wherein the means for imparting reciprocating movement is an electro-magnet.

9. An apparatus for operating on rectangular envelopes formed with shallow vertical side walls, some of which carry flaps with a non-tacky thermoplastic glue thereon, to be adhered to a horizontal wall of the envelope while the side walls are maintained in a vertical position, said apparatus including a hopper having four vertical walls, at least two of which are movable towards and away from said vertical side walls, means for imparting rapid reciprocating movement to said movable side walls, conveyor means for feeding the folded envelopes to the bottom of a stack of envelopes in said hopper, heating means attached to the lower ends of at least two of said hopper walls to reactivate the adhesive while the side walls to which the flaps are secured are maintained in a vertical position as a result of said reciprocating movement, the weight of the envelopes above the heating zone furnishing sufficient pressure to adhere the flaps to said horizontal wall.

10. A method of maintaining side walls of a rectangular box blank in vertical position while flaps are adhered to a horizontal wall of the box, portions of the blank having a dry thermoplastic adhesive thereon, said method comprising the steps of feeding the folded blanks into the bottom of a hopper containing a stack of the folded blanks and having vertical walls which engage said side walls of the box blank, imparting a rapid reciprocating movement to at least two of said hopper walls while heating the lower section of said latter hopper walls to reactivate the adhesive.

11. A method of maintaining side walls of a box blank in vertical position while flaps are adhered to a horizontal wall of the box, portions of the blank having a dry thermoplastic adhesive thereon, said method comprising the steps of feeding the folded blanks into the bottom of a hopper containing a stack of the folded blanks and having vertical walls which engage said side walls of the box blank, imparting a rapid reciprocating movement to at least two of said hopper walls, and heating the lower section of the vertical walls to reactivate the adhesive.

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FRANK E. BAILEY, *Primary Examiner.*