

Oct. 2, 1962

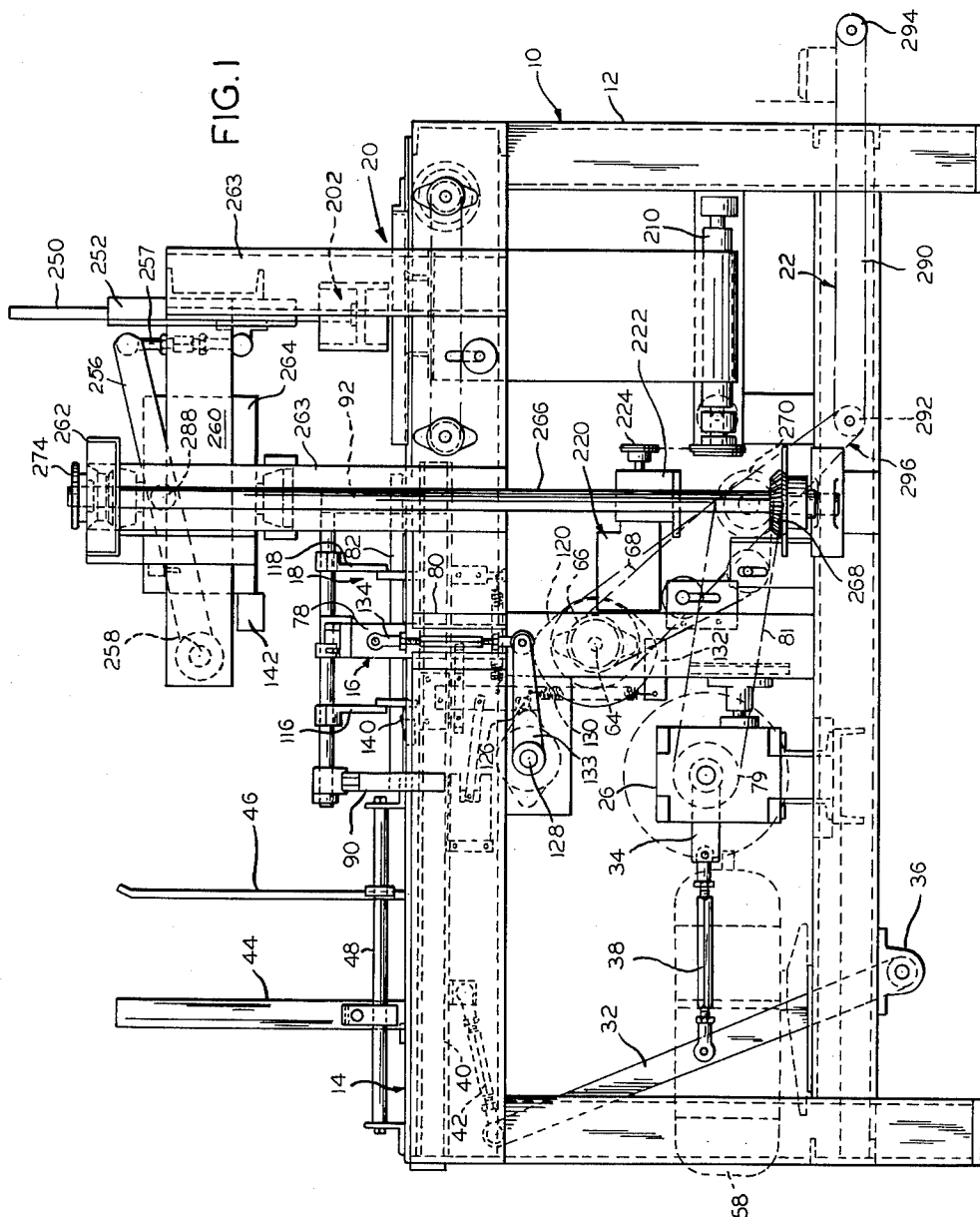
G. K. BAHR ET AL

3,056,337

FORMING AND GLUING MACHINE

Filed Dec. 1, 1959

7 Sheets-Sheet 1



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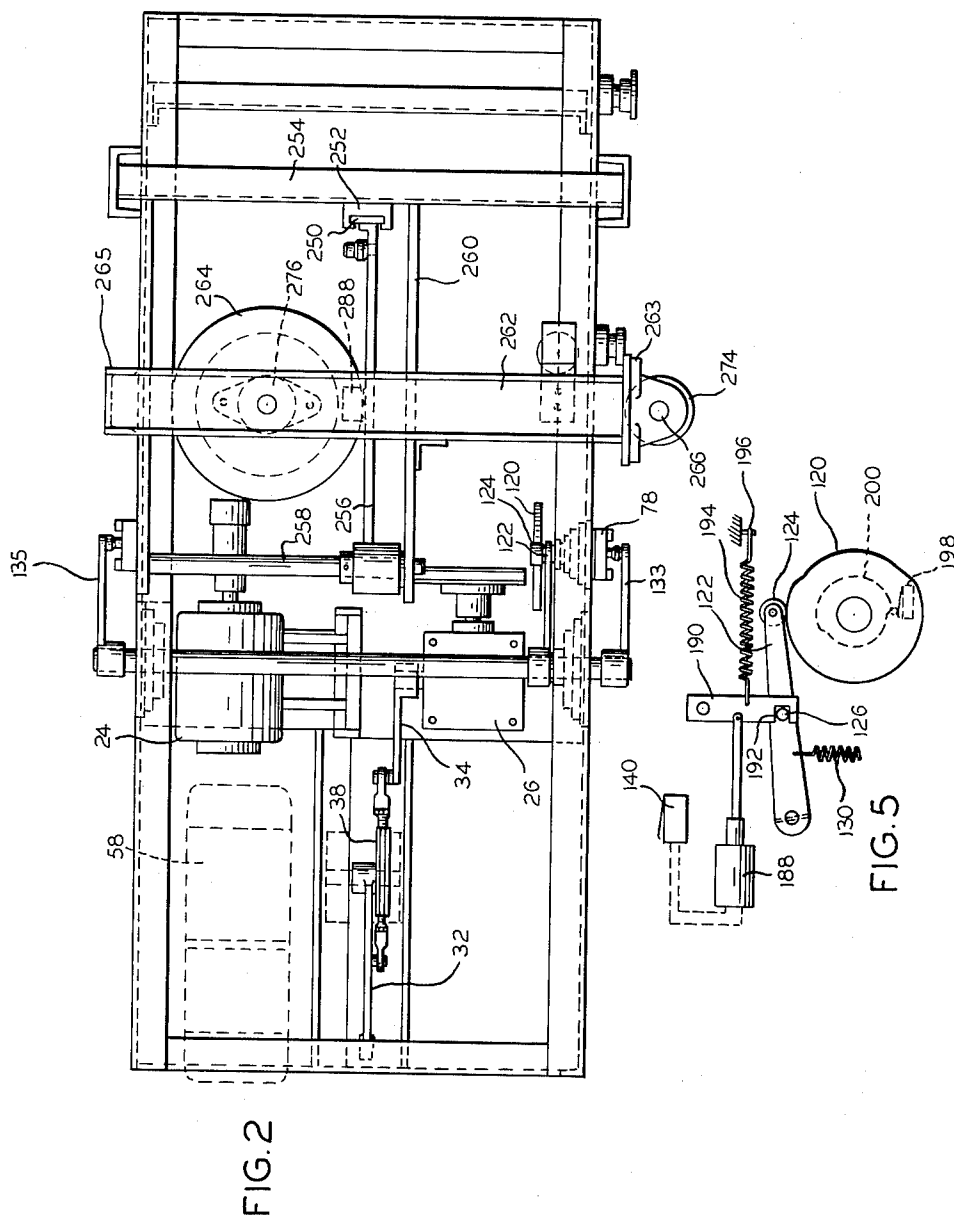
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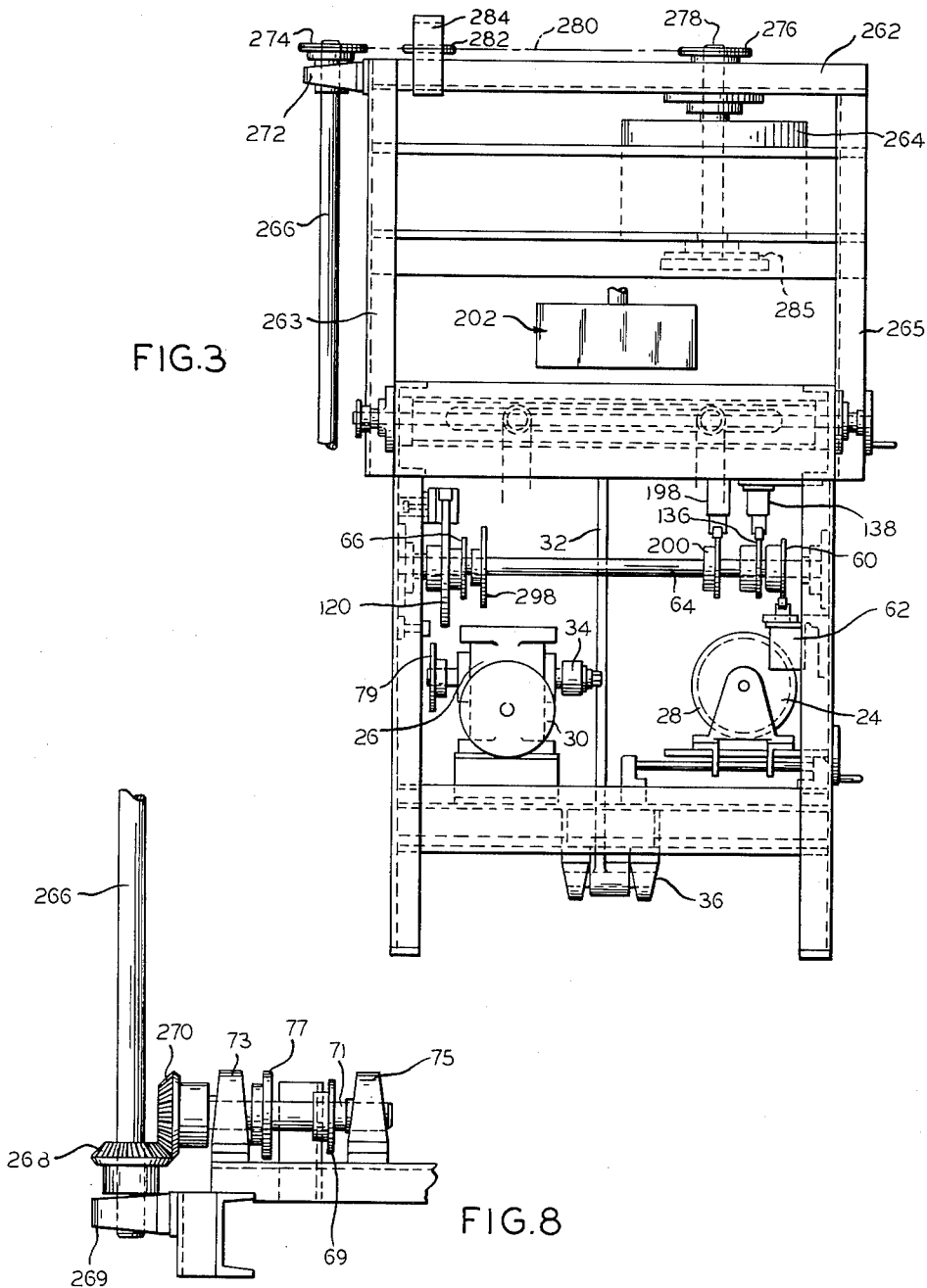
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7 Sheets-Sheet 3



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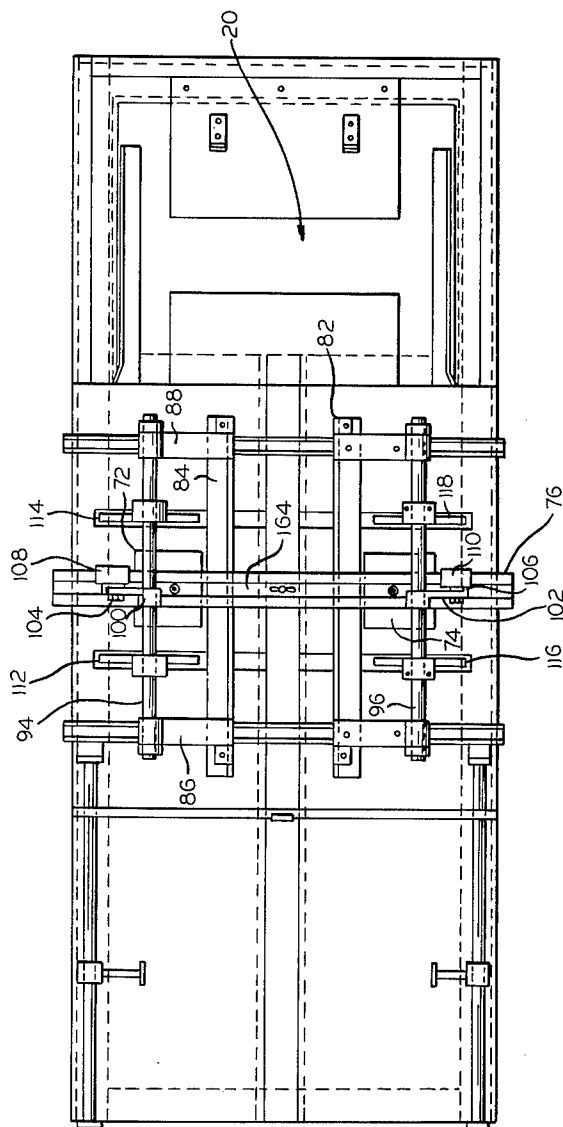


FIG. 4

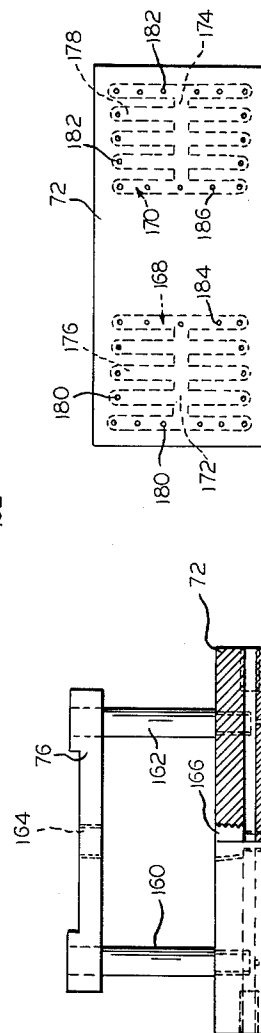


FIG. 6

FIG. 7

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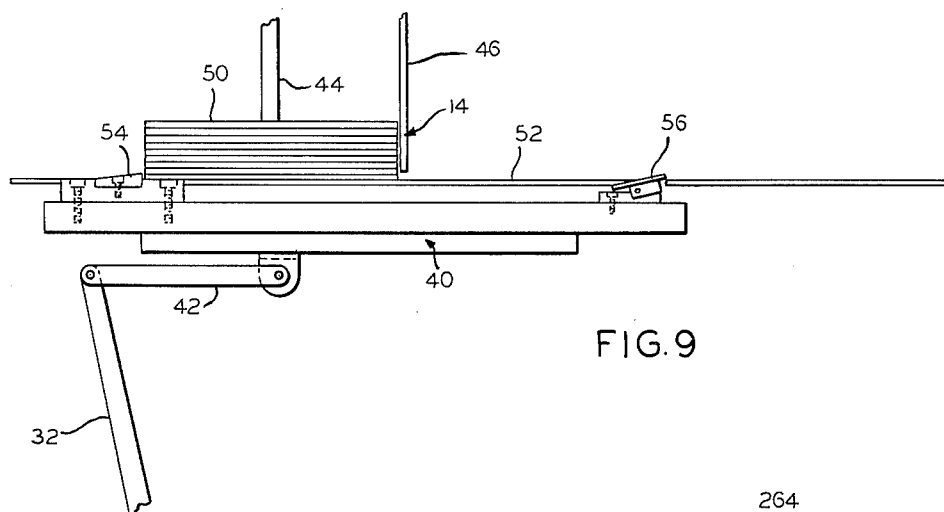


FIG. 9

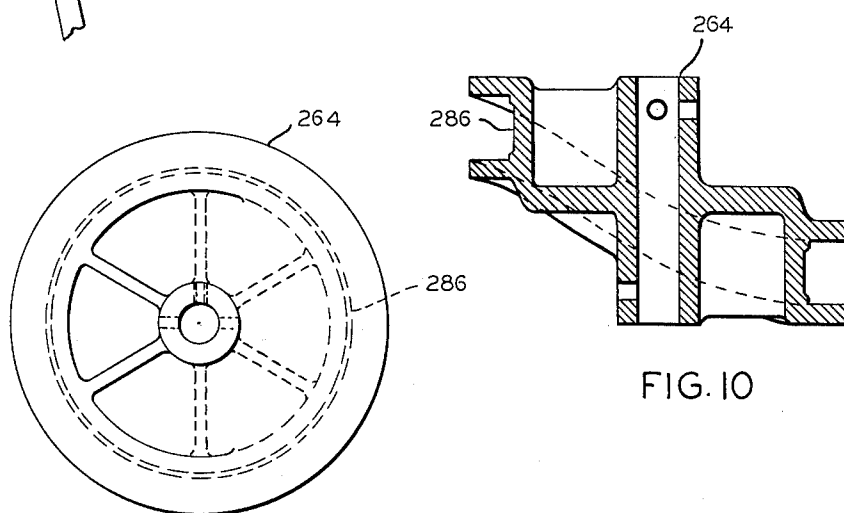


FIG. 11

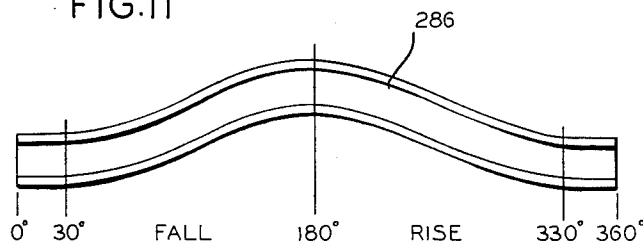


FIG. 12

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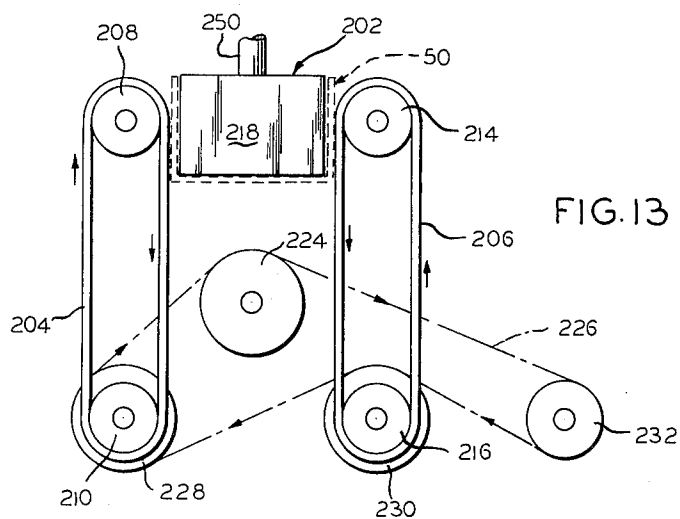


FIG. 13

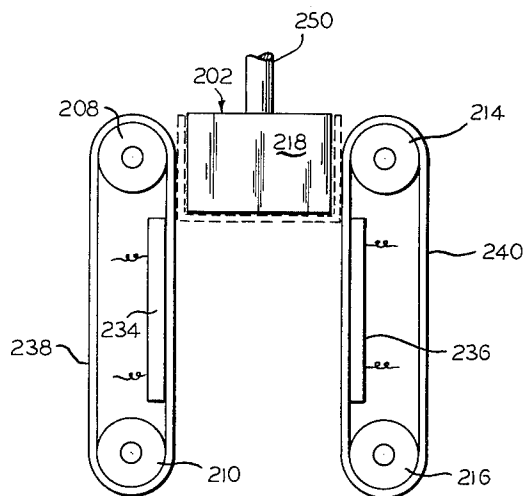


FIG. 14

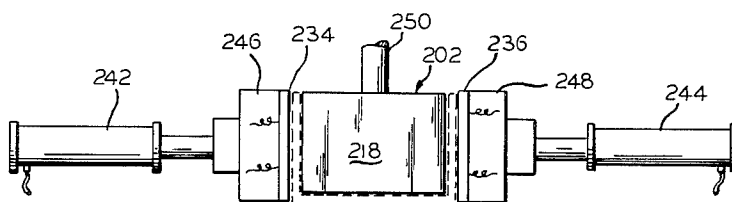


FIG. 15

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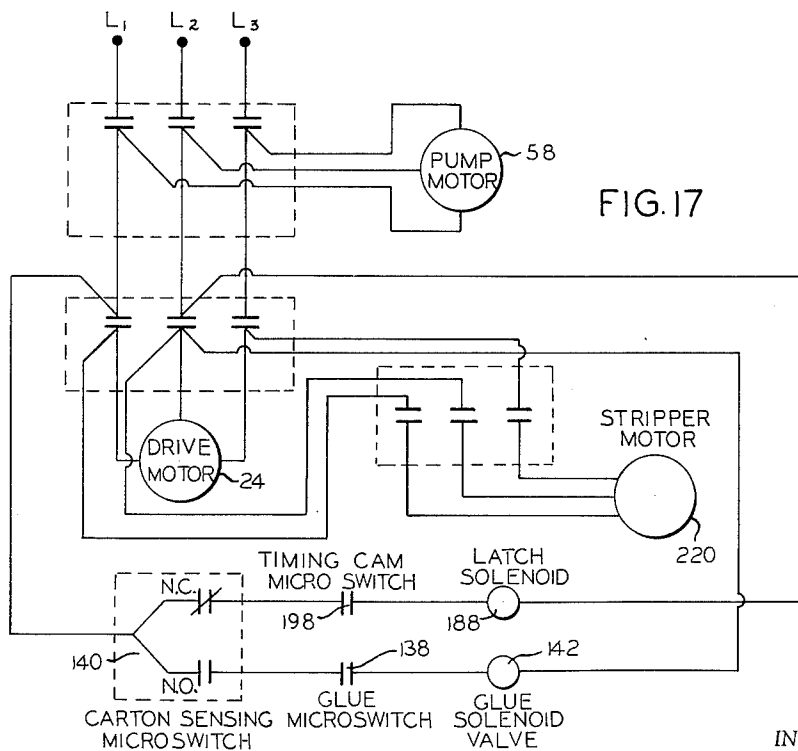
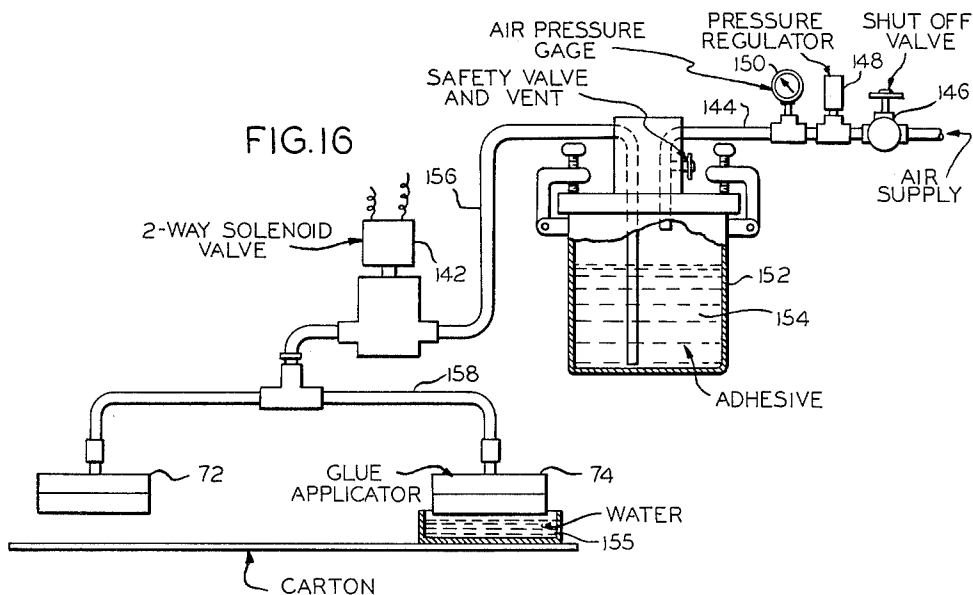
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7 Sheets-Sheet 7



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## FORMING AND GLUING MACHINE

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7 Claims. (Cl. 93—51)

This invention relates to a forming and gluing machine for paper cartons and the like, and more particularly to a forming and gluing machine providing timed control of the gluing operation without clogging and with safety means for preventing gluing operations when no carton is in position for gluing.

Heretofore, various types of gluing devices have been available for gluing paper cartons and the like, but they have generally either used operating elements which have tended to stick, or have otherwise required specially constructed check valve and nozzle means which did not fully perform a gluing function without hand control and other special attention.

The forming and gluing machine of the present invention provides means for sliding cartons successively to a gluing station in conjunction with vacuum hold down means therefor, and includes synchronously actuated glue applicators for gluing the end flaps of a box or carton to be formed and glued which are controlled to prevent clogging and waste. The applicators include inlet means for feeding glue from a suitable glue receptacle to a shoe portion having a flat surface and an internal network of branching channels leading from the inlet. Orifice means lead from these channels to the bottom gluing or contact surface of the shoe elements, these orifice means being preferably formed in a predetermined peripheral pattern around the shoe so as to contact a flap or other portion of a carton to be glued and provide adhesive means therefor. In order to complete the assembly of the carton, end flap folders are provided which are timed correspondingly with the operation of the glue applicators, and an end portion of the machine provides a forming run for pressing the glued portions of the cartons together and forming the carton in a completed box form. The forming run utilizes a pair of vertically parallel belts for receiving the box as it is inserted therein by a plunger or mandrel which is also operated in timed relation to the gluing and folding means hereinabove described.

Accordingly, it is an object of the present invention to provide a gluing and forming machine which will automatically complete all phases of a box forming operation without the need for human intervention.

Another object of the invention is to provide a device as described which affords sequential timing of a gluing operation, a folding operation, and a forming operation, but which at the same time prevents the gluing operation from occurring when a carton is not present at the gluing station.

Other objects and advantages of the invention will become apparent as the description proceeds in accordance with the drawings in which:

On the drawings:

FIGURE 1 is a side elevational view of a forming and gluing machine according to the present invention;

FIGURE 2 is a top plan view with parts removed of the structure of FIGURE 1;

FIGURE 3 is an end elevational view of the structure of FIGURES 1 and 2;

FIGURE 4 is a further view with parts removed of the structure shown in FIGURE 1;

FIGURE 5 is a schematic view of lifting means for glue applicator and timing means for the gluing and forming machine of the invention;

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FIGURE 6 is an end view in enlarged fragmentary partial vertical section of a glue applicator according to the invention;

FIGURE 7 is a bottom plan view of the structure shown in FIGURE 6;

FIGURE 8 is a fragmentary end elevational view of drive means for the gluing and forming machine of the invention;

FIGURE 9 is a schematic side elevational view of carton feeding means according to the invention;

FIGURE 10 is a vertical sectional view of a mandrel cam according to the invention for operating the forming run;

FIGURE 11 is a top plan view of the structure shown in FIGURE 10;

FIGURE 12 is a schematic view of the construction of the cam shown in FIGURES 10 and 11;

FIGURE 13 is a diagrammatic view of the forming run of the invention;

FIGURE 14 is a diagrammatic showing of a different embodiment of the forming run of the invention;

FIGURE 15 is a further embodiment of the forming run of the invention;

FIGURE 16 is a schematic view of the gluing means of the invention; and

FIGURE 17 is a schematic view of a circuit for controlling the operation of the device of the invention.

As shown on the drawings:

Referring now to the drawings, a forming and gluing machine 10 is shown according to the present invention which comprises a support framework 12 having a carton feeding station 14, a gluing station 16, carton flap folding station 18, a forming station 20, and an outlet station 22.

The carton feeding means 14 include a motor 24 driving a speed reducer 26 through driving means including pulleys 28 and 30 and a carton pushing lever 32 driven from the speed reducer 26 by a crank 34 thereon. The carton pushing lever 32 is pivotally mounted in bearing means 36 at the base of the support frame 12 and a connecting rod 38 connects the crank 34 and the lever or pushing arm 32. The upper end of the lever 32 is pivotally secured to a slide 40 by means of a connecting rod 42 and a carton magazine is provided including a pair of vertically formed arms indicated by reference numeral 44 secured in laterally spaced relation to the top of the frame structure 12 and an adjustable gate 46 slidably mounted on longitudinally extending bars 48. As seen in FIGURE 9, cartons 50 positioned between the upright arms 44 may rest in stacked relation on a support plate 52 on the frame structure 12, and a pusher 54 is mounted on the slide 40, which is received in suitable guide means on the frame 12 so as to afford a pusher assembly for successively moving cartons from the magazine. The adjustable gate 46 desirably terminates immediately above the lowest of the cartons 50 so as to prevent cartons thereabove from passing longitudinally forward in response to reciprocating movement of the pusher 54; and a catch unit 56 is pivotally mounted on the forward end of the pusher assembly thus provided, and is balanced so that as the slide member 40 and the pusher carry a lowermost carton forwardly along the surface 52, within a suitable longitudinal opening for receiving the pusher element 54, the unit 56 will move a carton from the gluing station forwardly as seen in FIGURE 9. Thereupon the element 56 will tilt to a horizontal position and will permit the pusher assembly to retract while leaving a carton in position for gluing. The pusher assembly and the catch unit 56 will then move the carton which had been in the position shown in front of the catch unit to the forming position, as hereinafter further described.

The means 14 also include vacuum means for holding

the cartons in position on the slide support surface 52 at the initial position thereof shown in FIGURE 9 so that it will be in contact with the pusher, and for this purpose, a vacuum pump 58 is provided, together with suitable conduit means (not shown). The vacuum pump is driven 5 in timed relation to the reciprocal movement of the slide 40 by means of a cam structure 60 operating a vacuum valve 62 and driven by a shaft 64 journaled in the frame structure 12. The shaft 64 in turn has a sprocket 66 driven by means of a suitable chain 68 entrained on a sprocket 69 on a shaft 71, the shaft 71 being journaled in bearings 73 and 75, as hereafter further described, and driven from the reducer 26 by a sprocket 77 connected to a sprocket 79 on the reducer by a chain 81.

In accordance with the invention, the gluing station 16 includes gluing applicator shoes 72 and 74 mounted on a transverse bar 76 supported by slide bars indicated by reference numeral 78 which are slidably received in guides 80 on the frame 12. Carton hold down strips 82 and 84 may be dependingly carried by transverse bars 86 and 88 mounted on uprights such as indicated at 90 and 92 in FIGURE 1 so that when the glue applicators 72 and 74 are elevated as hereinafter described upon completion of a gluing operation, the carton glued will be disengaged therefrom.

The flap folding means 18 include a pair of longitudinally extending shafts 94 and 96 journaled in the transverse bearings 86 and 88 and each provided with a crank 100 and 102 respectively having a cam roller at the ends thereof as indicated at 104 and 106, for slidable engagement beneath glue flap folder adjusting brackets 108 and 110 respectively. Thus, as the glue applicator mounting bar 76 is reciprocated vertically, the longitudinally extending shafts 94 and 96 will be rotated, thereby rotating pairs of glue flap folders 112 and 114, and 116 and 118 respectively. Accordingly, it will be seen that the glue flap folders will fold the flaps of a carton as the glue applicators 72 and 74 move downwardly into their gluing position, and thereafter retract upon elevation of the applicators.

The glue applicators in turn are reciprocated synchronously with the movement of the mounting bar 76 and the slide bars 78, and to effect such movement of the assembly, a glue applicator cam 120 is mounted on the shaft 64 which is configured and dimensioned to drive a cam follower 124 on an inner pivot arm 122. The arm 122 also carries a latch roller 126 as hereinafter further described, and is fixedly secured to a shaft 128 journaled in the frame 12. The cam follower 124 is held firmly in contact with the cam 120 by suitable spring means 130 secured intermediate the ends of the arm 122 at its upper end and to a bracket 132 at its lower end, and the shaft 128 carries outer arms 133 and 135 which are secured at their outer ends to the slide bars 78.

Timing of the dispensation of glue from the glue applicators 72 and 74 is controlled in accordance with the rotation of the glue applicator cam 120 by means of a glue timing cam 136 also secured to the shaft 64. Preferably, the glue timing cam 136 maintains a micro-switch 138 in closed position, and as seen in FIGURE 17, is operated in conjunction with a carton timing micro-switch 140, also shown in FIGURE 1, so that when a carton is in position for gluing, a two-way solenoid valve 142 will be actuated to supply glue to the applicators 72 and 74. As seen in FIGURE 16, air is supplied through a conduit 144 for this purpose as controlled by an air-shut-off valve 146 and a pressure regulator 148 utilized in conjunction with an air pressure gauge 150. The air thus supplied maintains glue in liquid form under pressure in a suitable receptacle 152, the glue or adhesive being indicated by reference numeral 154. Thus, when the two-way solenoid valve 142 is actuated as described, glue will be moved through a conduit 156 past the valve structure 142 and into a bifurcated conduit 158 of flexible characteristic which leads to the glue applicators 72 and 74. However,

the supply of glue to the glue applicators will be shut off by the rotation of the glue timing cam 136 in accordance with the elevation of the applicators so that an excessive supply is not spilled over the machinery. Suitable basins 155 may be provided as desired to hold the applicators in a liquid when the machine is not in use, thereby preventing hardening of the glue in the applicators.

As seen in FIGURES 6 and 7, the glue applicators 72 and 74 are secured in position on the bar 76 by suitable depending arms such as are indicated at 160 and 162, with the conduit means 158 being received through a preferably elongated slot 164 in the bar 76. It will be appreciated, however, that variation in this particular construction will be encompassed within the scope of the invention.

The invention provides for application of glue on the end flaps of a container or carton in a pattern such as will afford a secure adhesion thereof to the inner side portions of the carton without more glue than is required being applied. To this end, the shoes or applicators 72 and 74 each define a central conduit 166 communicating with preferably spaced networks of internal conduits 168 and 170 in the shoe. These networks 168 and 170 each have a central passage as indicated at 172 and 174 in FIGURE 7 and branching conduits 176 and 178. In accordance with the invention, a peripheral pattern of outlet apertures extend downwardly to the bottom surfaces of the shoe around each of the networks 168 and 170 and, desirably, apertures such as are indicated at 180 and 182 are formed at the outer ends of the branches 176 and 178, further apertures 180 and 182 being formed at the outer branches of the networks and apertures 184 and 186 being formed along the inner branches of the networks 168 and 170 to dispense the glue in the desired configuration. Accordingly, when the glue is moved through the conduit 156 and the branch conduits 158 as described, the shoe will be in continuous gluing relation to the carton and will dispense glue in a pair of closed substantially rectangular figures on each of the end flaps.

In order to prevent glue from being dispensed when no carton is present beneath the glue applicators, as might occur through inadvertence or otherwise, latch means are provided which are also operated in synchronization with the cam means 120. Thus, the carton sensing micro-switch 140 responds to the absence of a carton in the gluing station and moves to a position such as to actuate a latch solenoid 188 shown in FIGURE 17. As seen in FIGURE 5, the latch solenoid 188 controls a latch 190 having a cutout portion or recess 192 for engaging the safety cam 126 on the arm 122, when the arm 122 is in its uppermost position as held by the cam 120. The latch is biased to the right by a spring 194 suitably secured to a bracket 196 and a micro-switch 198 is provided in series with the carton sensing micro-switch 140 and the latch solenoid 188 so that only when the micro-switch 198 is closed will the latch solenoid be actuated to draw the latch 190 to the left. The micro-switch 198 is controlled by a glue timing cam 200 rotatable with the cam 120, and so as to prevent the latch 190 from being damaged by upward movement of the inside arm 122 and the safety cam 126 when in the retracted latch engaging position shown in FIGURE 5, the cam 200 closes the micro-switch 198 only when the arm 122 is in its uppermost position. Thus, the arm 122 will not move upwardly into impact engagement with the latch 190, but instead, the timed relation between the cams 120 and 200 is such that the arm 122 will be substantially in position to engage with the latch 190 before the latch 190 is drawn by the solenoid 188 into the position in FIGURE 5. When the latch is thus engaged, the applicators 72 and 74 are held in inoperative position.

As hereinabove set forth, the end flap folding arms 112 through 118 are also operated in conjunction with the vertically reciprocable movement of the glue applicator

mounting bar 76 so that after glue has been applied in the normal operation of the device, the end flaps will be lifted into position to enter the forming run station 20. It will be understood that the blanks may be pre-cut to permit the portions of the ends thereof engaged by the end flap folding arms 112 through 118 to be separately raised, for folding into engagement with the glued portions of the blanks upon entry into the forming stations 20, also as understood by those skilled in the art. The glued carton is then moved forwardly into the position of the station 20 by the slide 40 and catch unit 56, as hereinafter described. The forming run includes a forming mandrel 202 which, as seen in FIGURE 13, is effective to engage the carton positioned at the station 20 and move it downwardly between vertically parallel forming belts 204 and 206 entrained over upper and lower rollers 208 and 210 and 214 and 216 respectively. Thus, the inner reaches of the belts 204 and 206 are spaced from the mandrel head 218 a distance such as to receive the end portions of a carton 50 being formed therebetween under predetermined pressure engagement, so that the adhesive connection between the ends of the carton and the inner end portions thereof is made secure. The belts are driven by a gear head motor 220 which may include a speed reducer 222 having a sprocket 224, the motor desirably affording overdrive such that speed differentials between the forming mandrel 202 and the belts 204 and 206 will not create any problem of jamming or the like. A suitable chain 226 is entrained over the sprocket 224 and over sprockets 228 and 230 for the rollers 210 and 216 respectively, and preferably over an idler sprocket 232.

As seen in FIGURE 14, forming means may be provided for use with polyethylene laminated cartons which include opposed heater elements 234 and 236 energized through suitable electrical connection means (not shown) as well as steel belts or bands 238 and 240 entrained over the rollers 208 through 216 as hereinabove described. The heater elements 234 and 236 are positioned in heat exchange relation with the bands 238 and 240 so that heat applied through the bands to the cartons will cause the polyethylene laminate to fuse and bond the cartons in assembled condition. Referring to FIGURE 15, a further modification of the structure shown in FIGURE 14 is provided which includes pressure means for causing the heater elements 234 and 236 to engage firmly with a carton being formed, the pressure means preferably comprising air cylinders 242 and 244 which are diagrammatically illustrated as carrying individual head portions 246 and 248 in abutting engagement with the heating members 234 and 236.

The vertically extending bar 250 of the mandrel 202 is slidably received in a guideway 252 on a transverse member 254 for movement in synchronization with the feeding of cartons to the forming station 20, by means of a lever 256 having a connecting link 257 pivotally secured to the slide 252. The lever is pivoted at its opposite end on a bar 258 secured to the frame 12 and to a member 260 connected to the member 254 and to a transverse support member 262 supported on uprights 263 and 265.

Synchronized movement of the lever 256 in the vertical plane is produced by a mandrel drive cam 264 driven by an upright mandrel drive shaft 266 suitably journaled in a bearing 269 at its lower end and driven by a bevelled gear 268 which in turn is driven by a complementary bevelled gear 270 on the shaft 71. The upper end of the drive shaft 266 is journaled in a bearing 272 positioned in the transverse member 262. The drive shaft carries a sprocket 274 for driving a sprocket 276 on the axle 278 of mandrel cam 264, by means of a suitable chain 280. Preferably, a tension control idler 282 is mounted on a bracket 284, for engagement with the belt 280.

The axle 278 of the mandrel cam 264 is suitably journaled in the transverse member 262 and in supporting

members 285, and as seen in FIGURES 1, 2 and 10-12, the cam track 286 of the mandrel cam 264 actuates a cam follower 288 on the lever 256 so that the fall and rise of the mandrel 202 are relatively gradual and may each take place through approximately 150° of angular rotation in synchronization with the operation of the belts 204 and 206.

After a carton has thus been stripped from the belts 204 and 206, it is received on a conveyor belt 290 which is entrained on rollers 292 and 294 to carry the carton outwardly of the frame structure and deposit it in a suitable location for use. Desirably, the roller 292 is driven from a chain 296 which in turn is entrained on a sprocket 298 on the shaft 64 so that the belt also is driven synchronously with the mechanism as a whole.

Although we have herein set forth and described our invention with respect to certain specific principles and details thereof, it will be understood by those skilled in the art that these may be varied without departing from the spirit and scope of the invention as set forth in the hereunto appended claims.

We claim as our invention:

1. In a gluing and forming machine, a glue dispensing member including glue deposition orifices, means for reciprocating said glue dispensing member including first cam means and lever means actuated thereby in operative relation to the glue dispensing member to move the glue dispensing member cyclically into contact and out of contact with an article to be glued, and means controlling the supply of glue to said glue dispensing member including second cam means driven synchronously with said first cam means and solenoid controlled valve means operated by said second cam means and conduit means leading to the glue dispensing member from a supply of glue, said controlled valve means controlling the flow of glue through said conduit means in accordance with the cyclical relation of the glue dispensing member to the article.

2. In a gluing and forming machine, a gluing station, a forming station, means for successively feeding cartons to said gluing station and thence to said forming station, said gluing station including glue dispensing means for gluing cartons fed thereto, cam means, lever means actuated by said cam means reciprocating said glue dispensing means synchronously with the movement of the carton feeding means, carton sensing means, latch means including solenoid means responsive to a signal from the carton sensing means to maintain the gluing means in inoperative position when no carton is present at the gluing station including a cam element on said lever means for engagement by said latch means, cam means actuated synchronously with said lever means and switch means in series with said carton sensing means to prevent operation of the solenoid until the actuating lever is in a predetermined position of safety relative to the cam means for operating the lever.

3. In a gluing and forming machine, a gluing station including glue dispensing means, a forming station, means for successively feeding cartons to said gluing station and to said forming station, carton sensing means, latch means including solenoid means responsive to a signal from the carton sensing means to maintain said glue dispensing means in inoperative position when no carton is present at the gluing station, said gluing station including glue feeding means for said glue dispensing means, a solenoid valve controlling said glue feeding means, cam means rotatable synchronously with said glue feeding means and switch means operated by said cam means in series with said carton sensing means and said solenoid valve means for feeding glue to the glue dispensing means through said glue feeding means only when a carton is in position in said gluing station and said glue dispensing means are in operative relation thereto.

4. In a gluing and forming machine, having carton feeding means for successively feeding cartons through

said machine, a forming run comprising a pair of belts spaced in parallel relation, means for moving said belts so that a carton positioned therebetween will be moved downwardly therealong and means for moving cartons into said belts including a forming mandrel having a head complementary to the spacing of said belts and forming a carton in cooperation with said belts, cam means rotatable synchronously with the operation of said feeding mechanism, and lever means actuated by said cam means and connected to said forming mandrel for reciprocating the forming mandrel as successive cartons are fed into operative relation therewith.

5. In a gluing and forming machine having a carton feeding means for successively feeding cartons through said machine, a forming run comprising a pair of belts disposed in spaced parallel relation, means for moving said belts so that a carton fed thereto will be moved downwardly therealong and means for feeding cartons into said belts including a forming mandrel having a head complementary to the spacing of said belts, cam means rotatable synchronously with the operation of said feeding mechanism, lever means actuated by said cam means and connected to said forming mandrel for reciprocating the same as successive cartons are fed into operative relation therewith and heating means in heat exchange relation with said belts, said belts being formed of a heat conductive material whereby polyethylene laminated cartons or the like may be assembled during passage through said belts.

6. A forming and gluing machine comprising a carton feeding station, a gluing station having reciprocating means for automatically gluing cartons fed thereto from the carton feeding station and a combination carton forming and removal station having a mandrel reciprocable

synchronously with the reciprocating means of the gluing station for completing the assembly of a carton fed thereto from the gluing station by the operation of the carton feeding station, and opposed belt means cooperating with the mandrel in forming the cartons and in stripping the cartons from the mandrel.

7. In a forming and gluing machine for cartons or the like, a gluing system including a glue receptacle, a glue dispensing member, means for moving glue from said glue receptacle to said glue dispensing member under pressure, solenoid valve means controlling the flow of glue through said means for moving glue to said glue dispensing means under pressure, and means in said machine controlling the operation of said solenoid valve means including a first carton sensing microswitch closed when a carton is in position to be glued and a second glue microswitch in series with the first carton sensing microswitch and cam means synchronously closing said second glue microswitch so that glue will be dispensed in response to closing of the first carton sensing microswitch.

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