United States Patent

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[15] 3,635,129

[45] Jan. 18, 1972

[54] TRAY FORMER

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[73] Assignee: ABC Packaging Machine Corporation

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[21] Appl. No.: 857,705

[52] U.S. Cl. ..... 93/51 R, 53/192, 93/36 MM, 93/49 AC

[51] Int. Cl. B31b 1/44

[58] Field of Search ..... 93/51, 51 M, 36 MM, 99 AC; 53/192, 194

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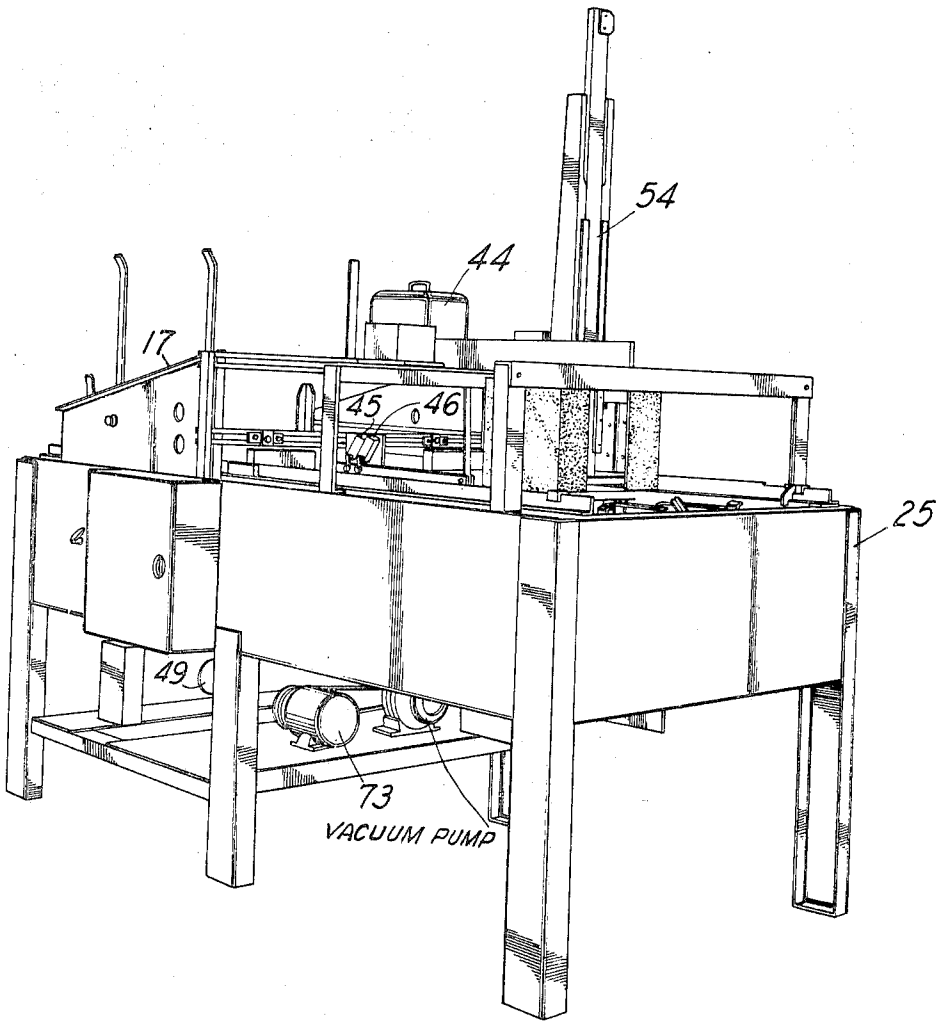
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Assistant Examiner—Eugene F. Desmond
Attorney—Newton, Hopkins & Ormsby

[57] ABSTRACT

A machine for forming shipping cases or trays from flat blanks having a storage magazine, stripping means for removing one blank at a time from the magazine, glue-applying means for selectively applying glue to desired portions of the blank, an indexing means for advancing the blank past the glue-applying means to a tray-forming mandrel, and means cooperative with the mandrel for folding up the sides of the blank and folding the ends thereof in threefold overlapping relation.

6 Claims, 17 Drawing Figures



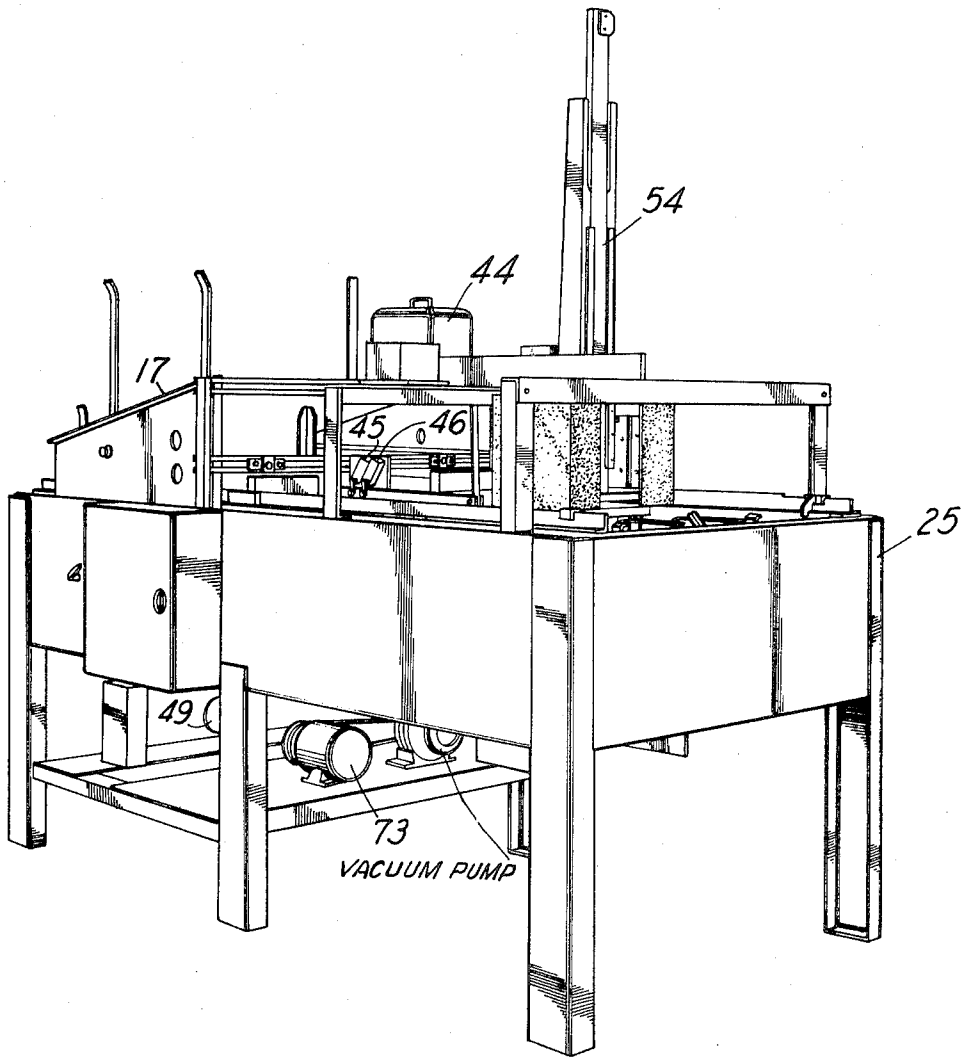


FIG 1

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ATTORNEYS

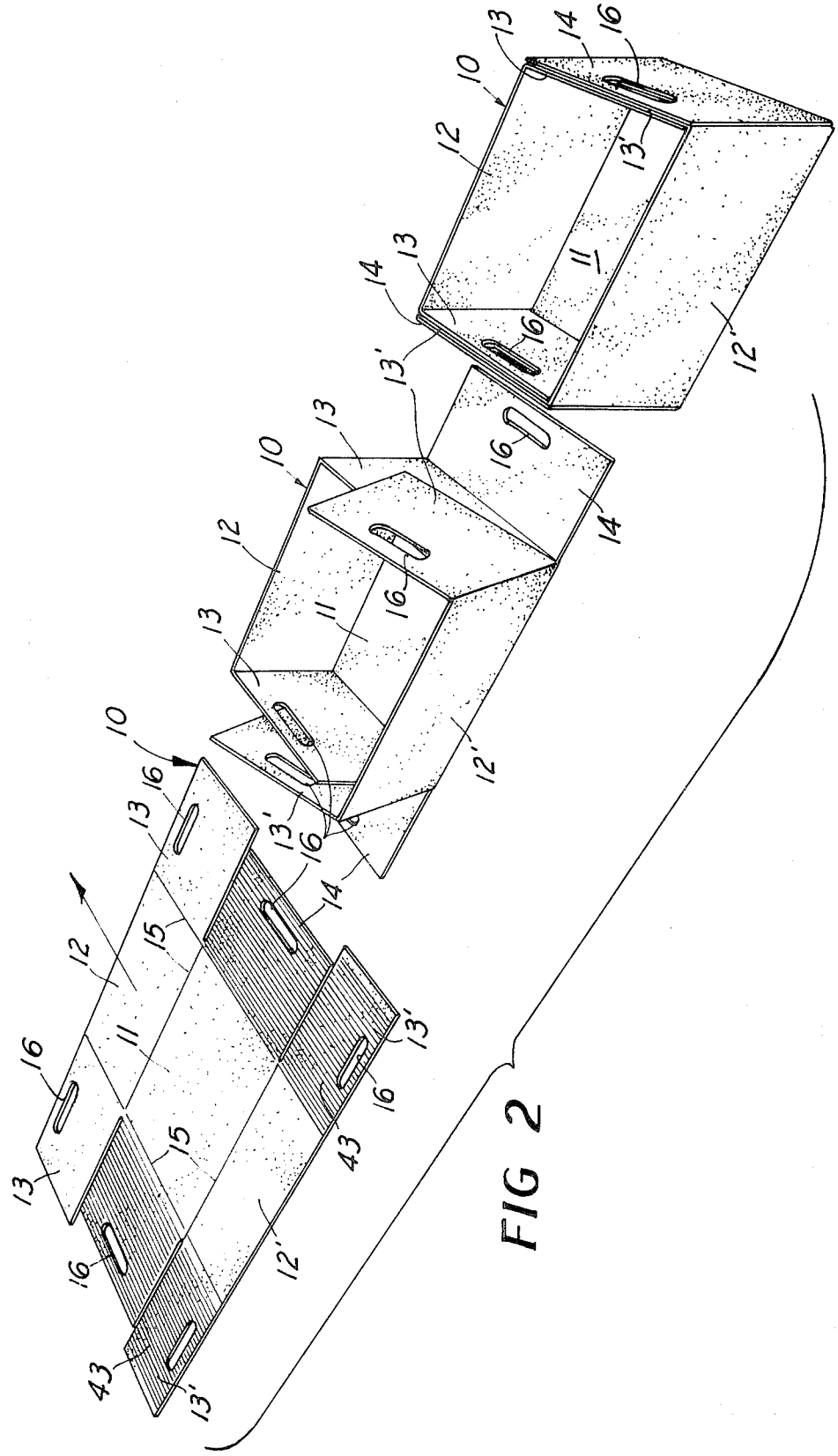


FIG 2

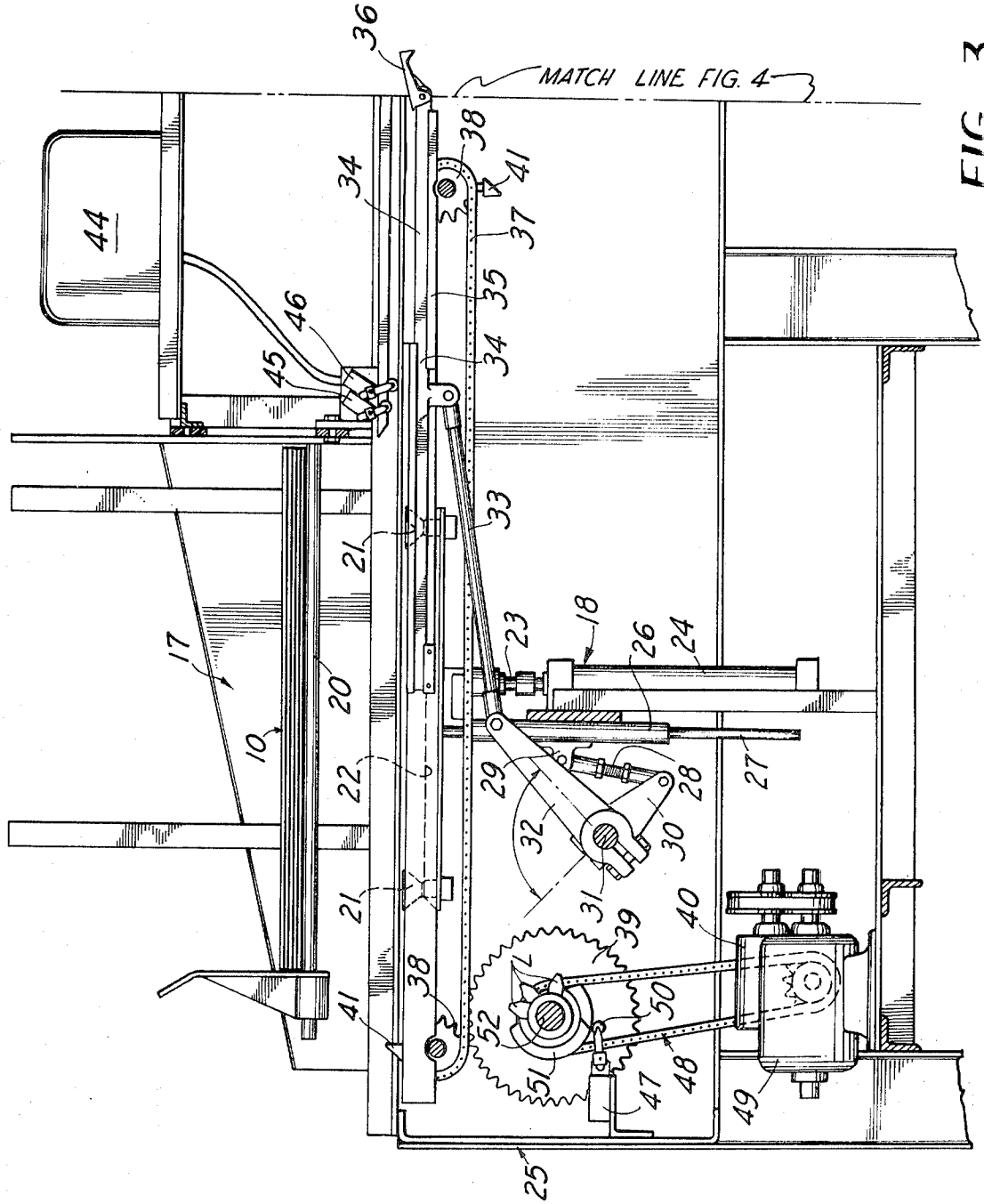

MATCH LINE FIG. 4
36
38
41
34
37
44
35
46
45
33
21
17
18
23
26
24
10
20
22
29
28
27
32
30
31
40
39
38
41
52
50
51
47
48
49
25

FIG 3

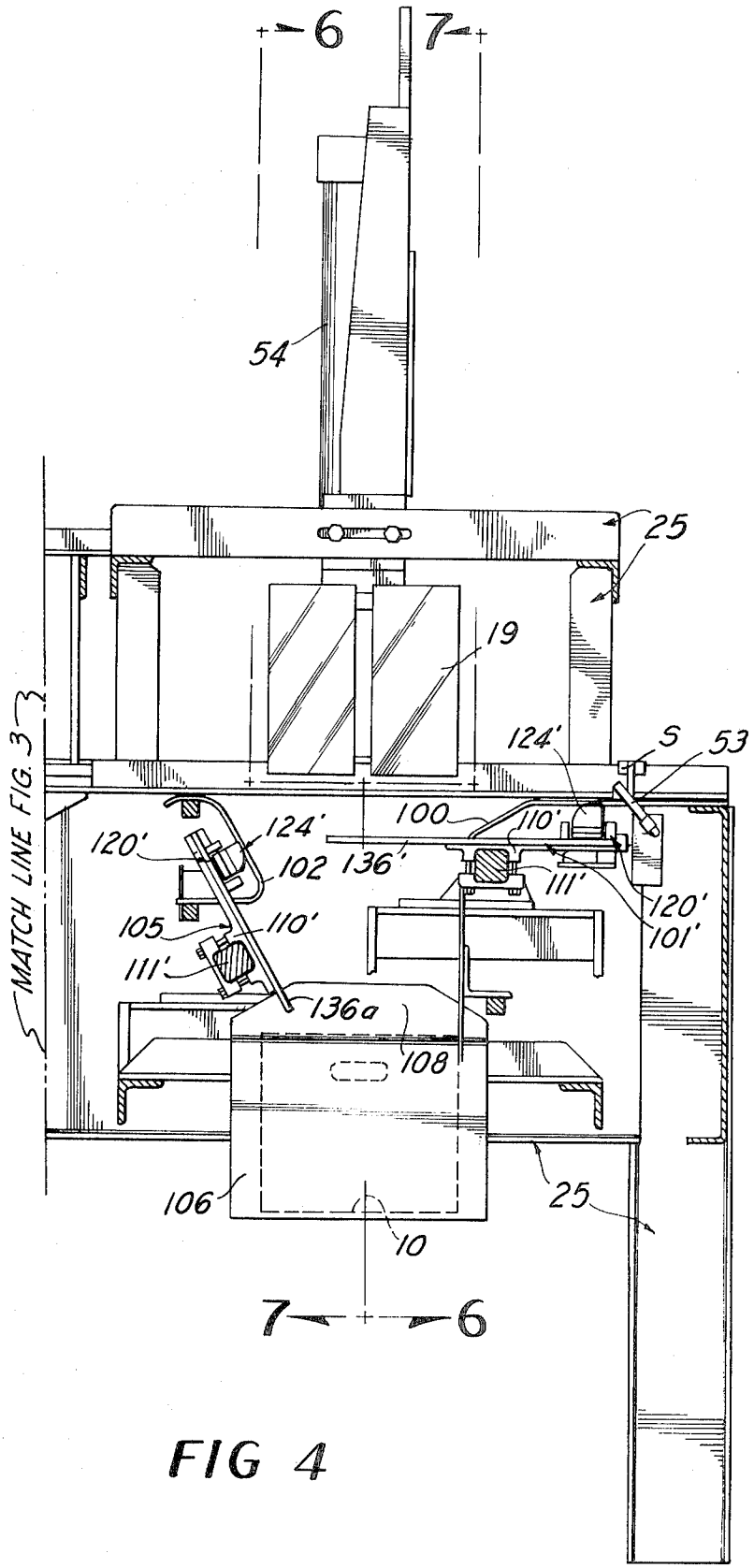

6
7
54
25
19
124'
5
53
100
110'
120'
124'
102
136'
111'
120'
101'
105
110'
111'
136a
108
106
25
10
7
6
MATCH LINE FIG. 3

FIG 4

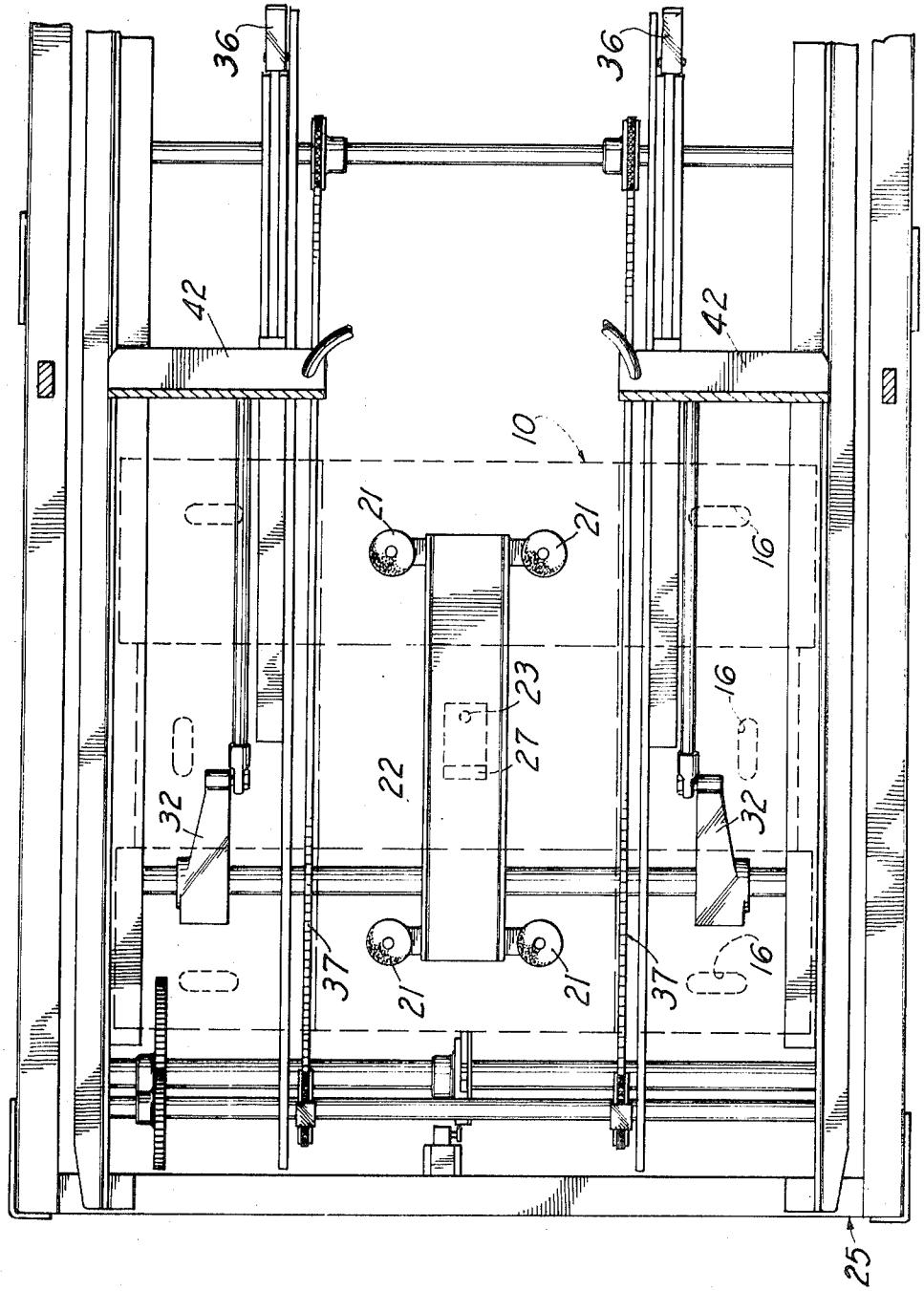


FIG 5

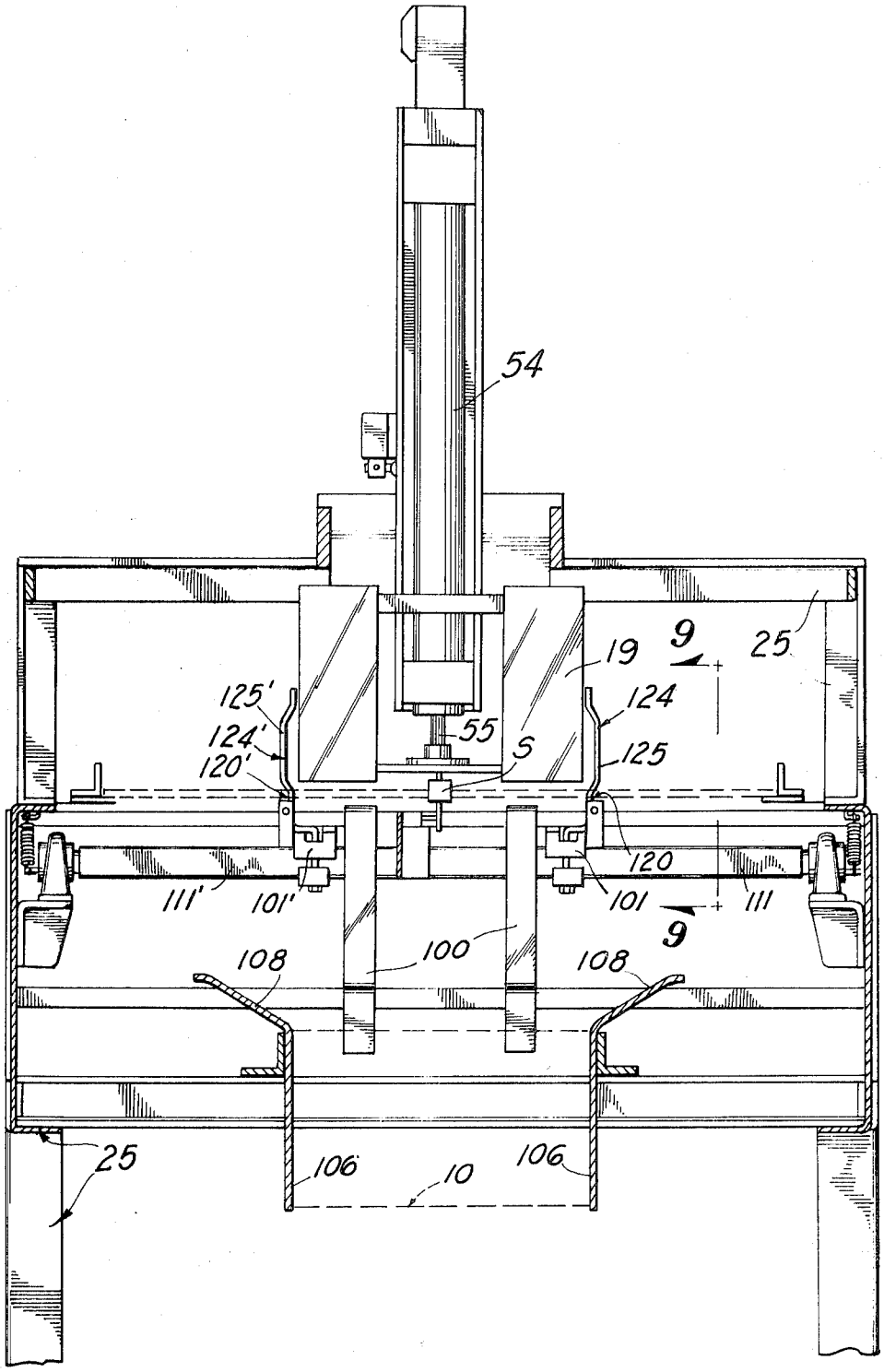

54
19
9
25
125'
124'
120'
55
S
124
125
120
111'
101'
101
111
9
108
100
108
25
106
10
106

FIG 6

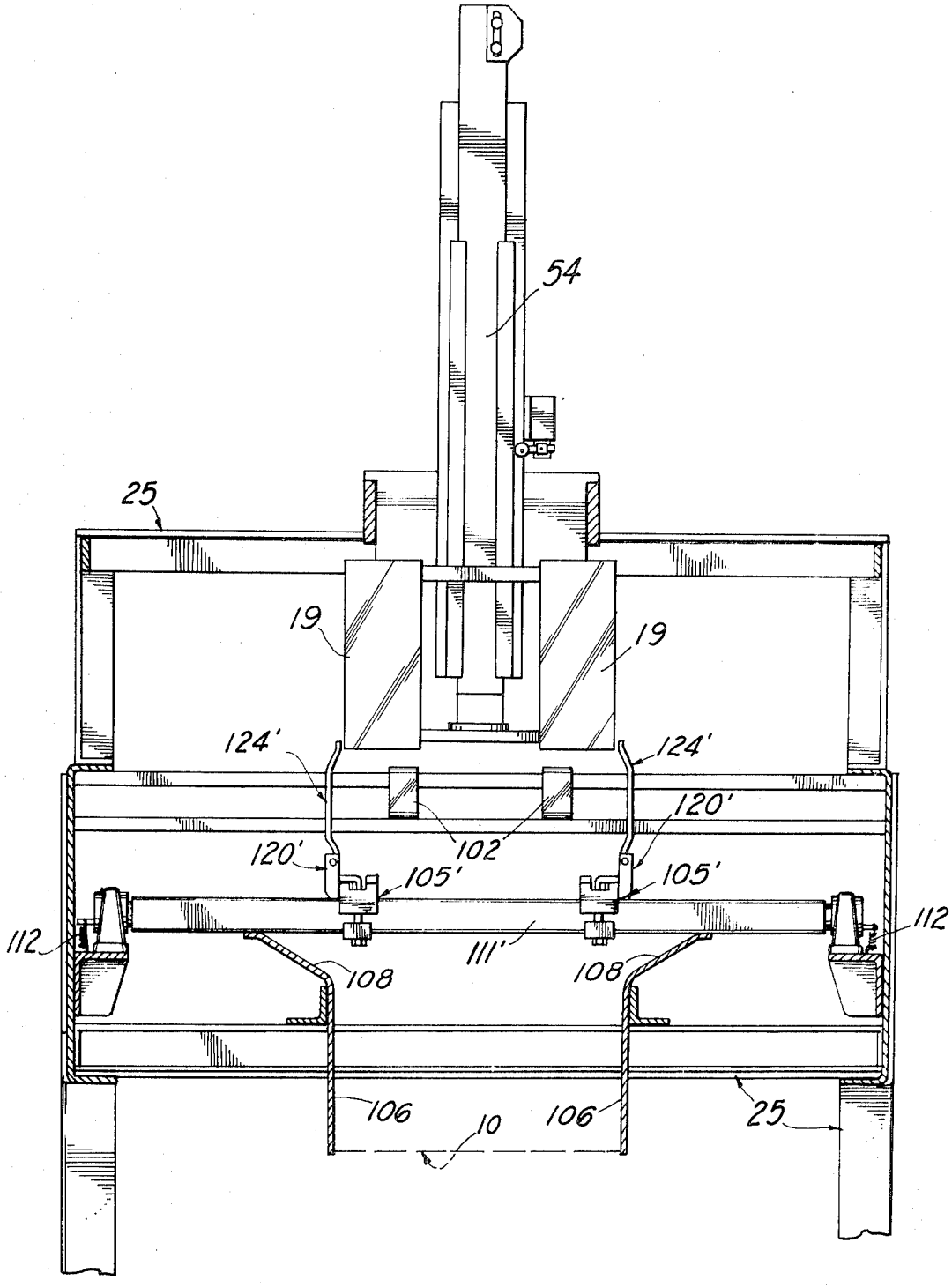

54
25
19
19
124'
124'
120'
102
120'
105'
105'
112
112
111'
108
108
106
10
106
25

FIG 7

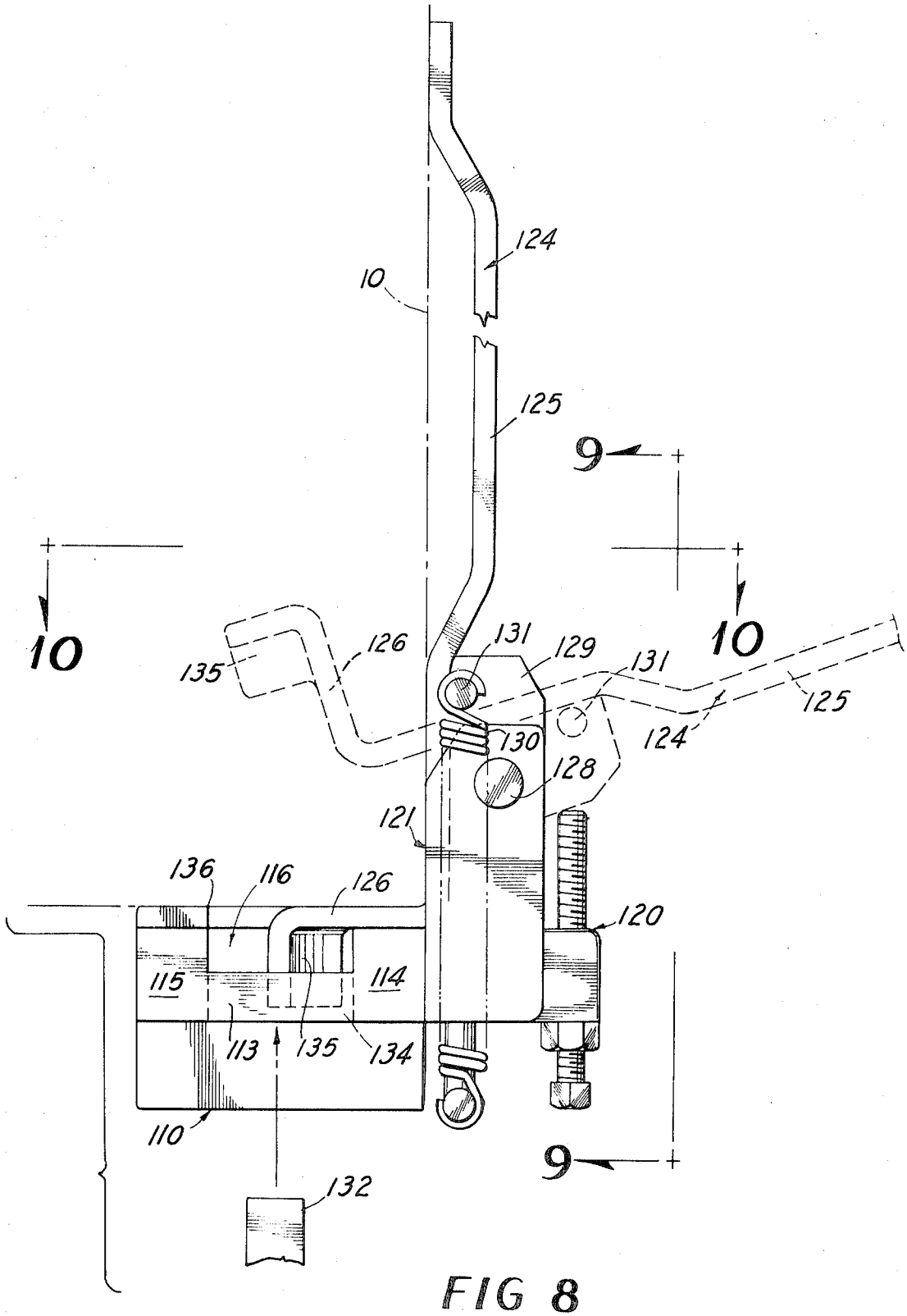
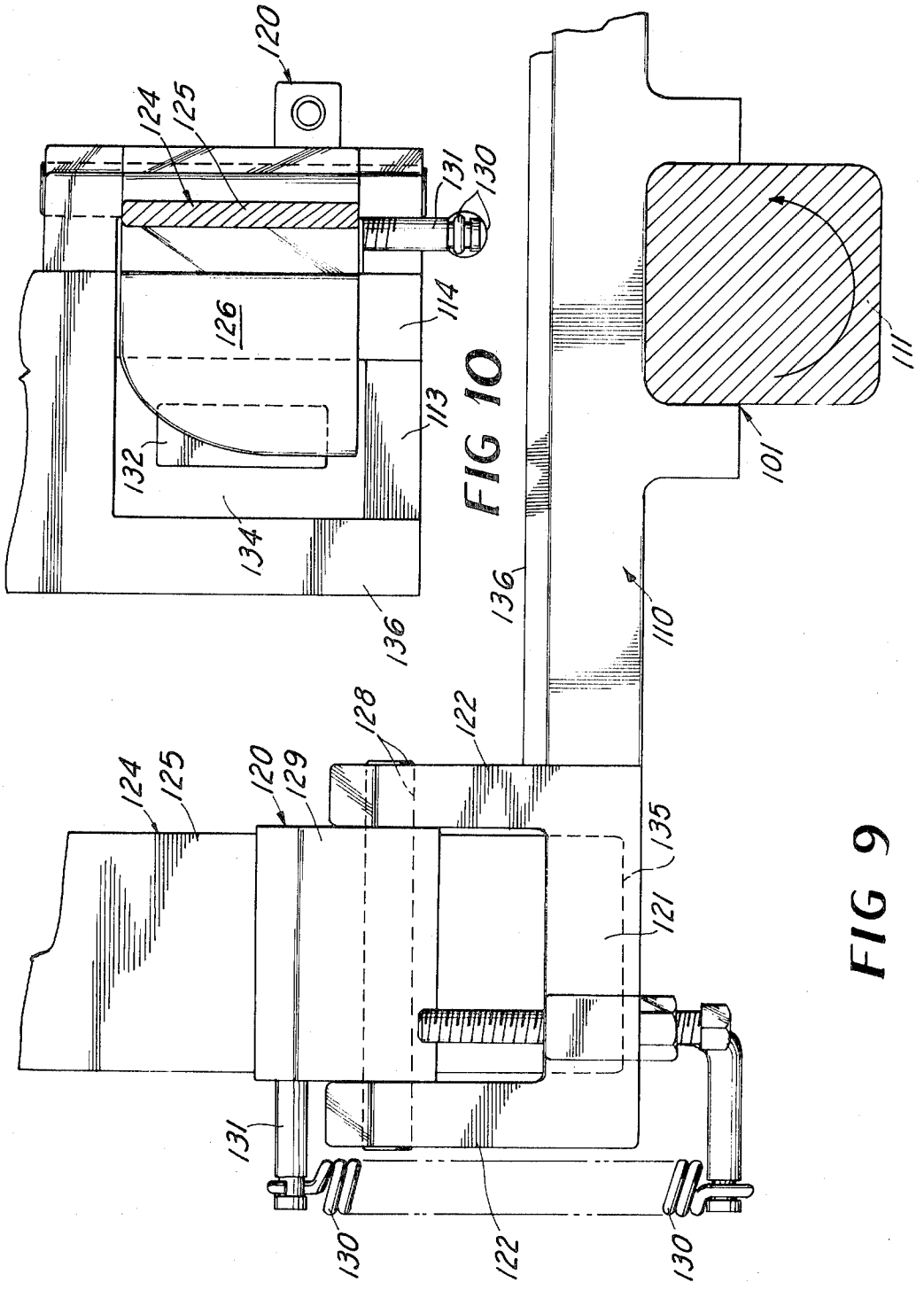

124
10
125
9
10
10
135
126
131
129
131
125
130
124
128
121
136
116
126
120
115
114
113
135
134
110
132
9

FIG 8


120
124
125
131
130
126
114
113
132
134
136
111
101
110
FIG 10
128
122
129
135
121
FIG 9

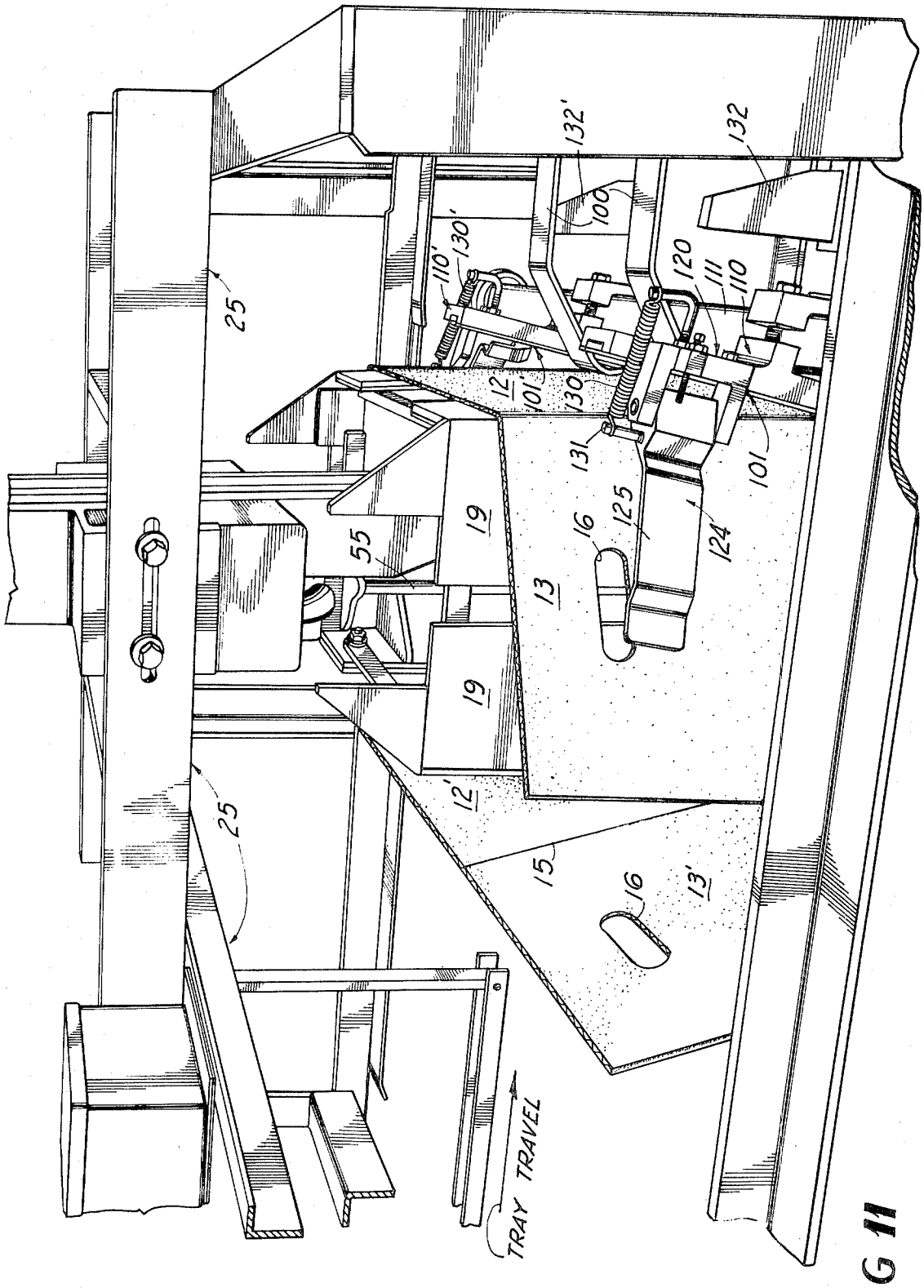

132'
132
100
130'
110'
120
111
110
25
12
101'
130
131
101
19
55
16
125
124
13
19
12'
25
15
16
13'
TRAY TRAVEL

FIG 11

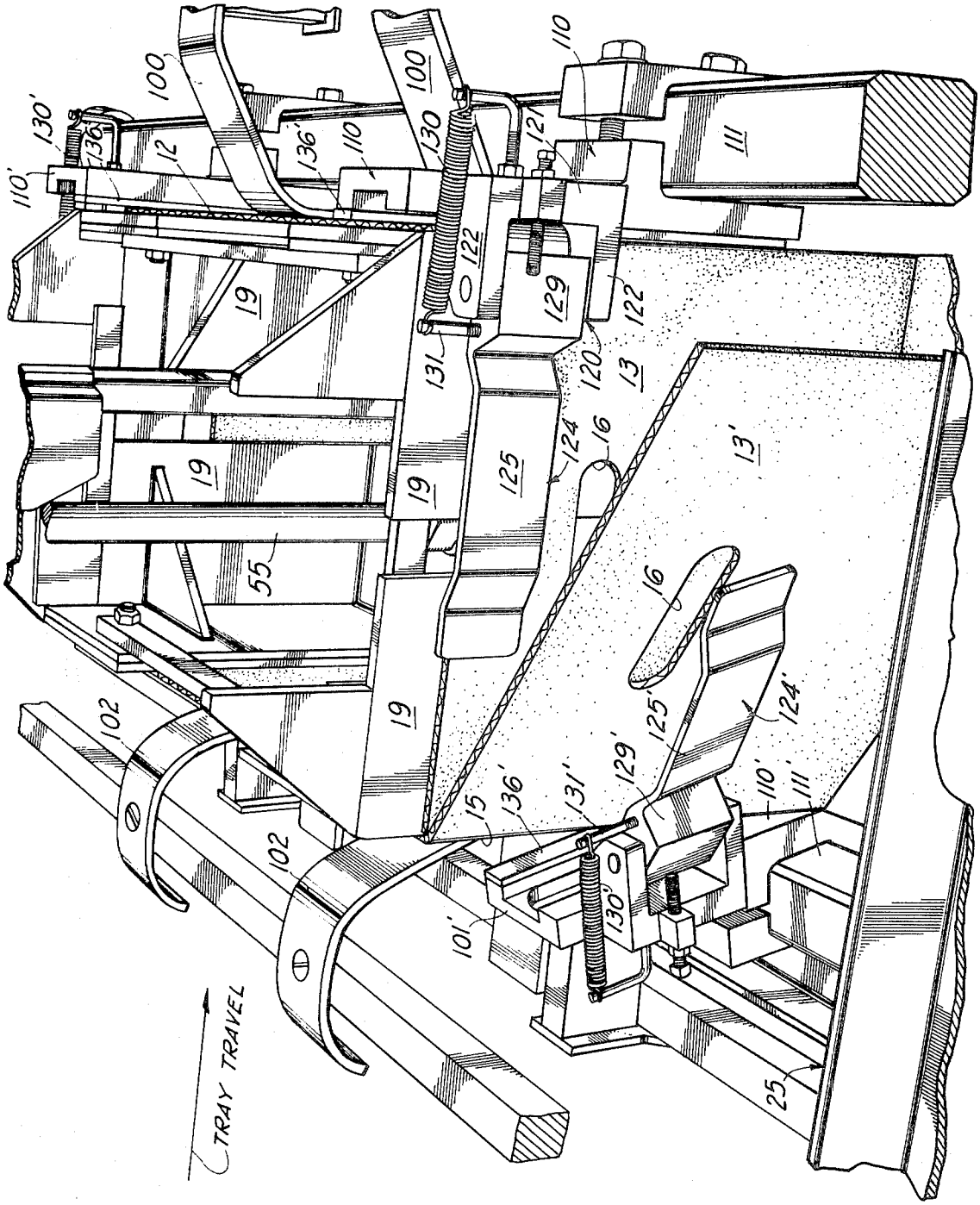

100
110
130'
136
12
136'
110
130
121
111
110'
122
129
122'
19
131
120
13
124
16
125
13'
55
16
102
125'
124'
129'
15
136'
131'
110'
111'
130'
101'
102
TRAY TRAVEL
25

FIG 12

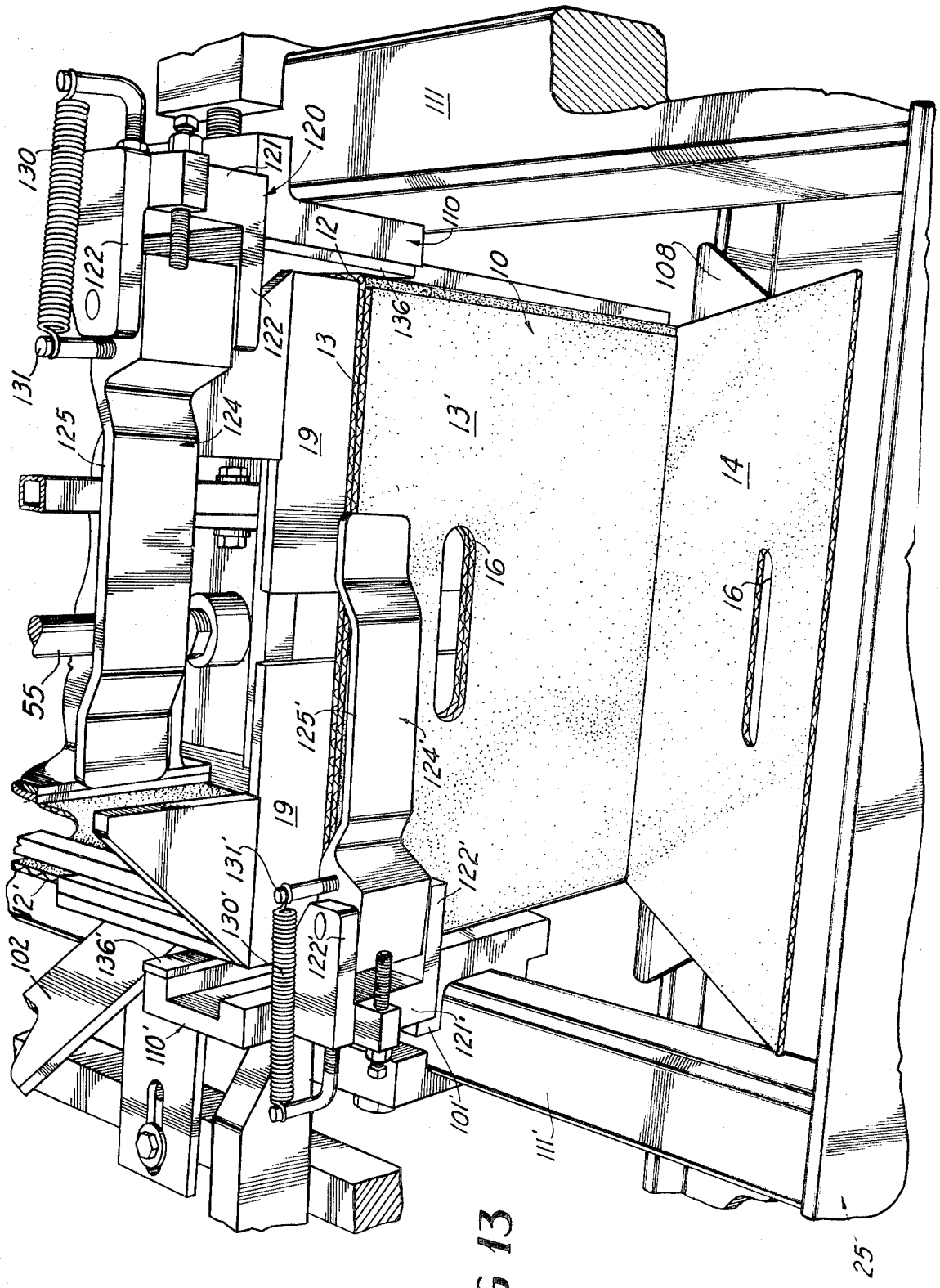

111
120
121
130
110
12
122
108
10
136
13
131
125
124
19
13'
14
16
16
55
125'
124'
19
131'
122'
12'
130'
102
136'
122'
110'
121'
101'
111'
25'

FIG 13

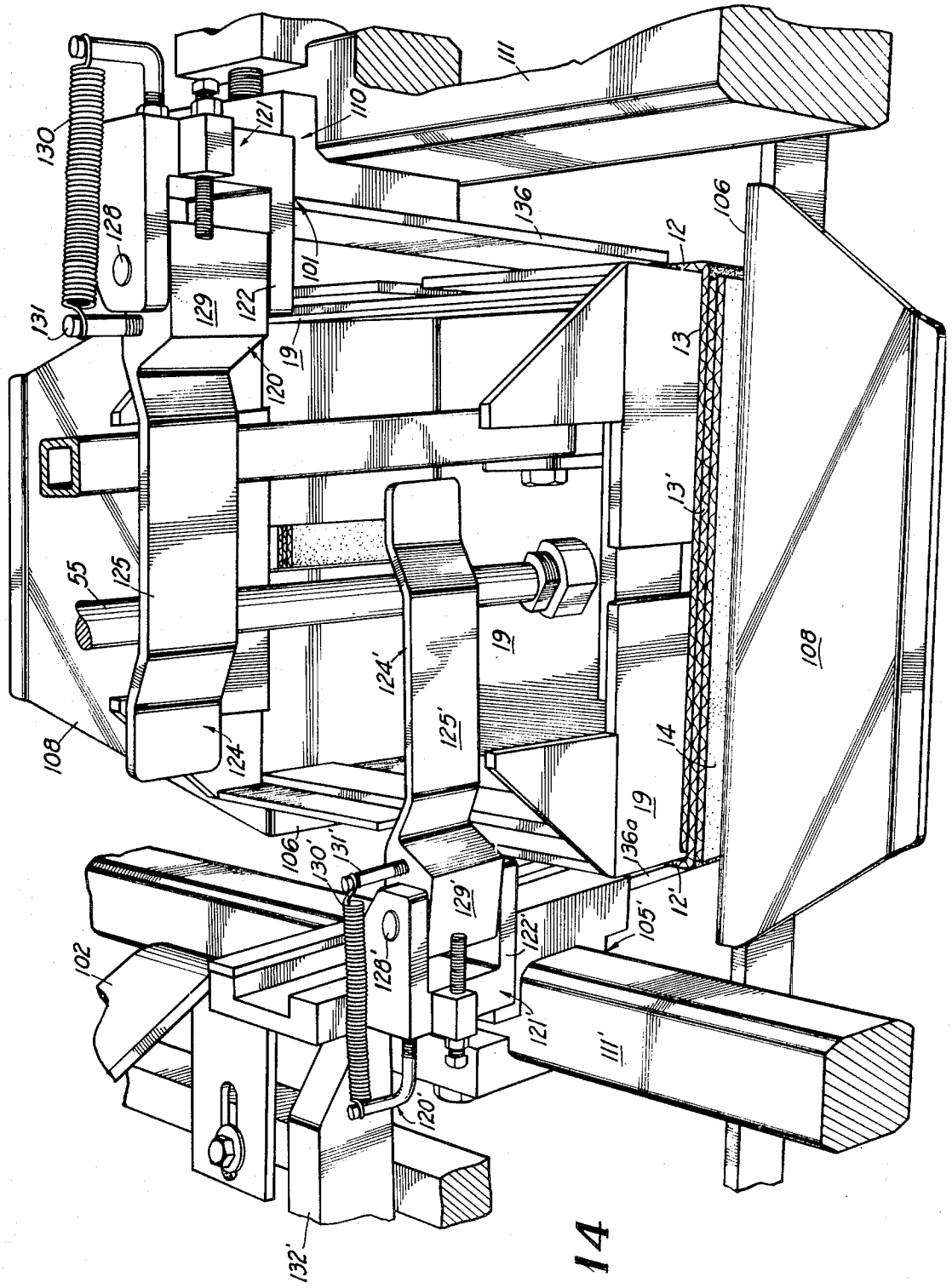

130
128
131
129
121
110
111
101
122
19
120
136
12
106
13
13'
108
55
125
124
124'
125'
19
14
136a
106
130'
131'
129'
122'
105'
12'
102
128'
121'
111'
120'
132'

FIG 14

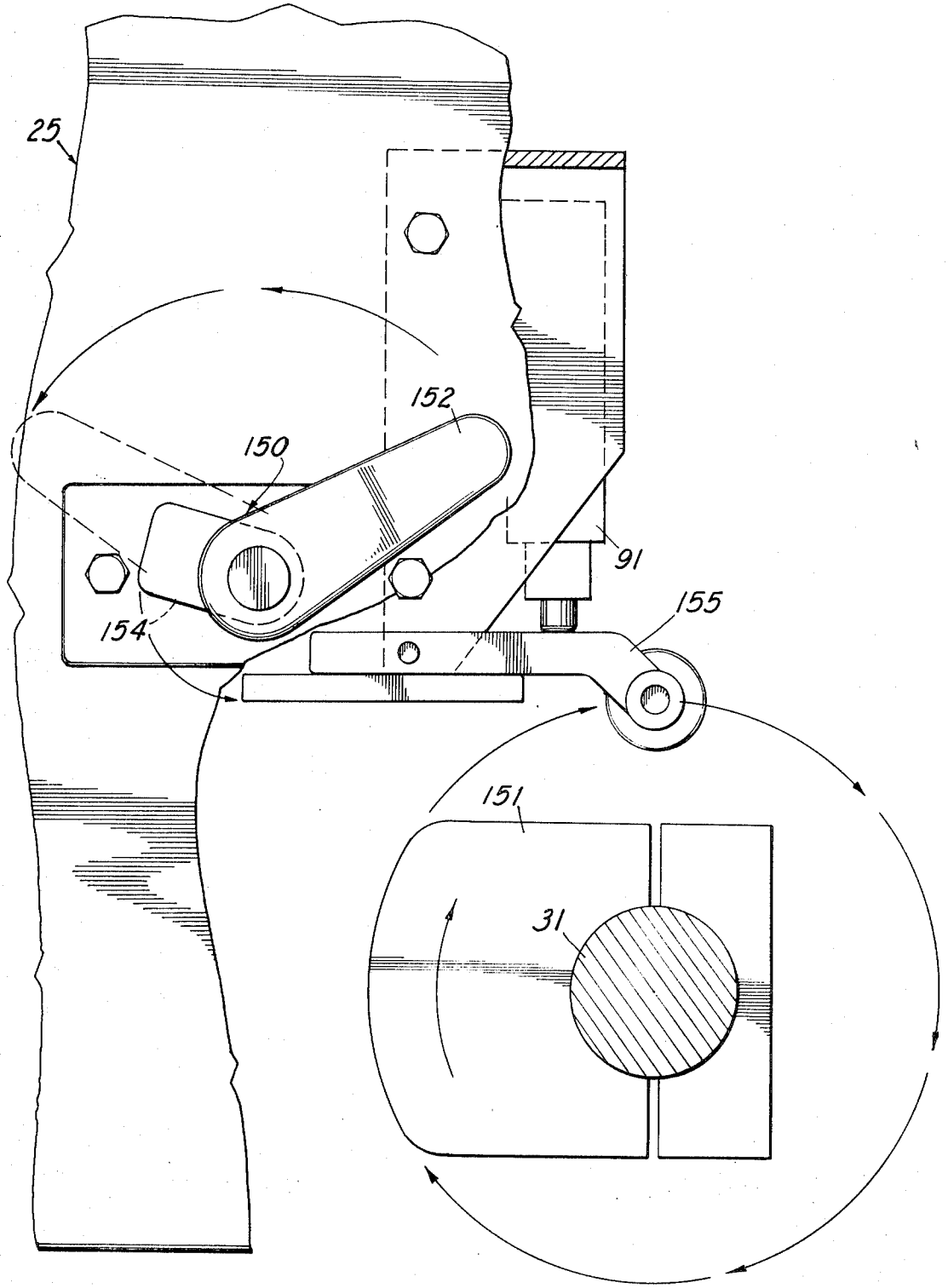


FIG 15

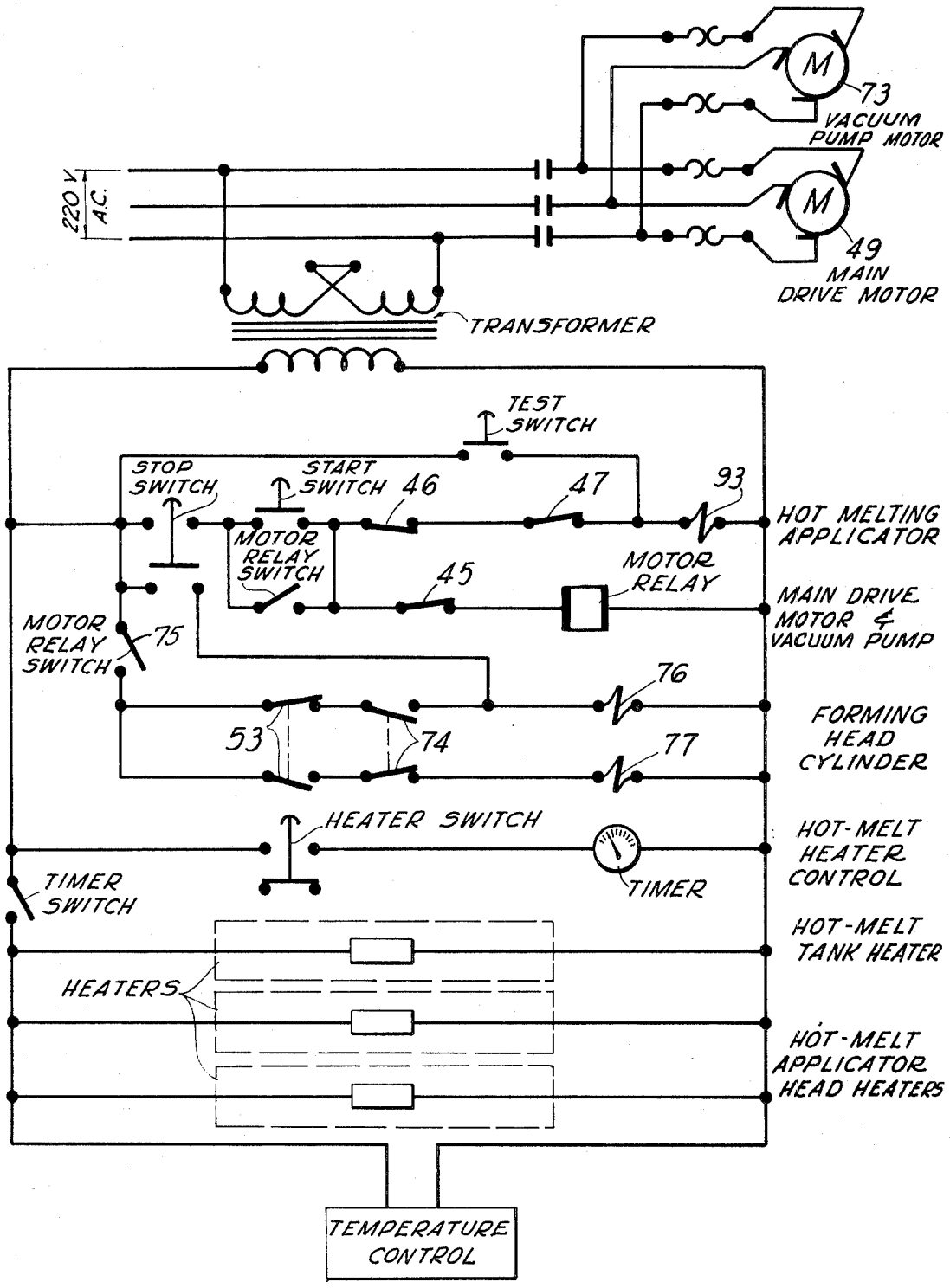

M
73
VACUUM PUMP MOTOR
M
49
MAIN DRIVE MOTOR
220 V A.C.
TRANSFORMER
TEST SWITCH
STOP SWITCH
START SWITCH
46
47
93
HOT MELTING APPLICATOR
MOTOR RELAY SWITCH
45
MOTOR RELAY
MAIN DRIVE MOTOR & VACUUM PUMP
MOTOR RELAY SWITCH
75
76
53
74
77
FORMING HEAD CYLINDER
HEATER SWITCH
HOT-MELT HEATER CONTROL
TIMER SWITCH
TIMER
HOT-MELT TANK HEATER
HEATERS
HOT-MELT APPLICATOR HEAD HEATERS
TEMPERATURE CONTROL

FIG 16

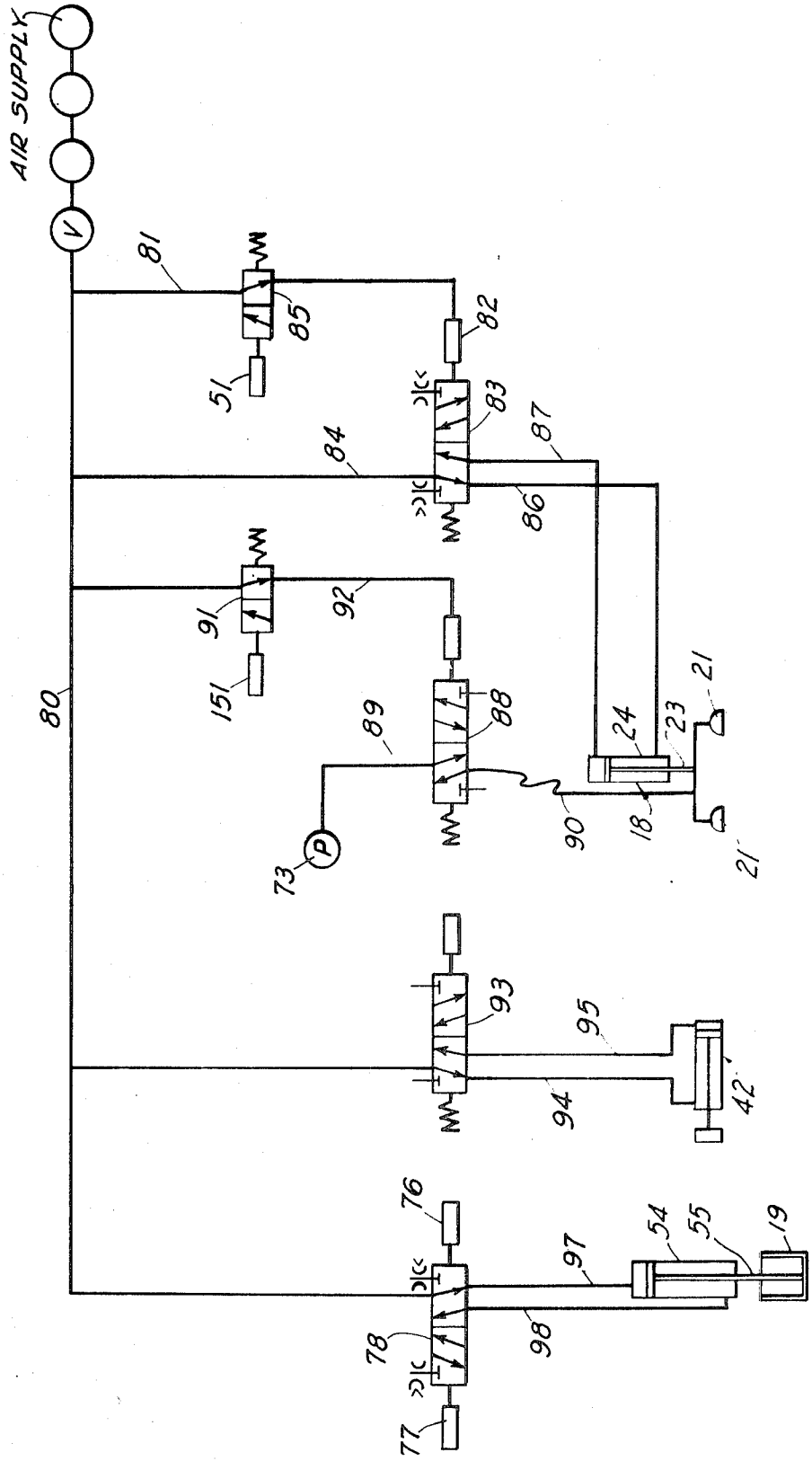

AIR SUPPLY
81
85
82
51
83
84
87
86
91
92
151
80
89
88
24
23
21
73
90
18
21'
93
95
94
42'
76
54
55
19
97
78
98
77

FIG 17

TRAY FORMER

BACKGROUND OF THE INVENTION

This invention relates generally to shipping case or tray forming machines and more particularly to a machine for setting up shipping cases or trays from blank forms, folding and sealing the flaps to wholly form the end and sidewalls thereof, and delivering the thus setup cases for packing or otherwise.

In shipping or storing various articles such as food, beverages or other products, it is customary to place them in shipping or packing cases constructed of heavy fibrous material, for example, corrugated board or pasteboard or the like. Such a corrugated case, having one open end for packing, is typically used in packing tomatoes, lettuce, and other vegetables and products wherein overlapping end panels are provided for strength and securement.

The shipping cases or trays come from the manufacturer packaged in bundles of flat blanks for convenience in handling. In the past these blanks were removed one at a time from their shipping bundle and set up by hand. But today, many machines for forming shipping trays are being widely used in the packaging industry. These machines for the most part, however, are generally bulky and require highly complicated camming and gearing arrangements. For these reasons, machines of this kind are very expensive to construct and also costly to maintain. Moreover, the machines now on the market operate slowly and many require skilled operators to supervise their performance.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved machine for forming shipping cases or trays from flat blanks and folding and sealing the flaps thereof in a closed position.

Another object of this invention is to provide a machine for forming shipping trays from blanks which will operate with the minimum of attention other than keeping the supply magazine thereof filled with the blanks.

Still another object of this invention is to provide a machine for forming shipping tray blanks which is fast and economical in operation, and simple and inexpensive in construction.

The foregoing and other objects, advantages and features are attained by a machine featuring a mandrel which engages the bottom panel of a tray-forming, corrugated blank during a downward travel and successively, during the advancement thereof, engages flap tuckers on one side thereof for folding a side panel upward against the mandrel and the end panels thereon inward about the mandrel, then engages another set of flap tuckers on the opposite side for folding another side panel up against the mandrel and end panels thereon inward about the mandrel and overlapping the first end panels, and finally engages a third set of flap tuckers on the ends thereof for folding up end flaps against the mandrel overlapping the overlapped end flaps formed from the side panels. An adhesive applied to the blank prior to engagement by the mandrel secures the folded and overlapped panels together. Upon retraction of the mandrel for receiving another blank, the tray or case thus set up is discharged from the bottom of the machine.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the overall machine constructed in accordance with the present invention;

FIG. 2 is a schematic showing the sequential steps in forming a tray with the machine of FIG. 1;

FIG. 3 is a longitudinal cross-sectional view of part of the machine;

FIG. 4 is a longitudinal cross-sectional view of the rest of the machine shown in FIG. 3;

FIG. 5 is a partial top view showing the pulldown assembly and blank-advancing mechanism of the machine;

FIG. 6 is a cross-sectional view taken along the line 6—6 of FIG. 4;

FIG. 7 is a cross-sectional view taken along line 7–7 of FIG. 4;

FIG. 8 is an enlarged top view of one of the flap folders;

FIG. 9 is an enlarged side view of the flap folder taken along line 9—9 in FIG. 8;

FIG. 10 is an enlarged view taken along the line 10—10 of FIG. 8;

FIG. 11 is a perspective view showing the leading flap being folded;

FIG. 12 is a perspective view showing the trailing flap being folded;

FIG. 13 is a perspective view showing the middle end flaps being folded;

FIG. 14 is a perspective view showing the tray being stripped from the mandrel;

FIG. 15 is an enlarged view partly broken away to illustrate the vacuum selector valve assembly;

FIG. 16 is an electrical control schematic; and,

FIG. 17 is a pneumatic control schematic.

DESCRIPTION OF AN ILLUSTRATED EMBODIMENT

Referring now to the drawings wherein like reference numerals are used to designate like or corresponding parts throughout the several views and more particularly to FIG. 2 thereof, there is shown a shipping case or tray indicated generally by the reference numeral 10, constructed of corrugated board, pasteboard or the like, in the collapsed blank form as received from the manufacturer and in the various successive stages in which it is normally set up for use. The shipping case or tray 10 comprises a rectangular bottom end 11, a pair of sidewalls 12 and 12′ connected to the bottom 11 along the longitudinal edges thereof and each having end flaps 13 and 13′, respectively, thereon and an end wall or flap 14 connected to each lateral edge of the bottom 11. Although illustrated herein as being generally rectangular in configuration, the cases or trays 10 may also be square, if desired.

The blank 10 is designed to be set up by bending the material of the side and end walls and the flap surfaces thereon along creases or score lines 15 which are provided at the corners. One of the sides 12 is folded at right angles to the bottom 11 and the flaps 13 thereon, which will be referred to hereinafter as the leading flaps, are folded inward at right angles to the side 12 and the bottom 11. The other side 12′ is folded at right angles to the bottom 11 and the flaps 13′ thereon, which will be referred to hereinafter as the intermediate flaps, are folded inward at right angles to the side 12′ and the bottom 11 to overlap the leading flaps 13. Finally, the end flaps 14, hereinafter to be referred to as the outer flaps, are folded upward over the intermediate flaps 13′. When folded in the manner indicated and secured as by gluing, a tray 10 is formed having the general appearance shown in FIG. 2. Slots 16 in the end flaps 13, 13′ and 14 provide convenient handholes for carrying the tray.

In reference now to the operation of the tray-forming machine and tracing the progress of a blank 10 through the machine, the blank forms are removed one at a time from a storage magazine 17 by a pulldown assembly 18 and conveyed to a mandrel 19 as best seen in FIGS. 3, 4, and 5. The stack of blanks 10 are supported on parallel guide bars 20 longitudinally disposed along the edges of the magazine 17 in the direction of travel of the blanks to the mandrel.

The pulldown assembly 18 comprises a set of vacuum cups 21 secured to a support 22 movably disposed in a vertical reciprocable path with the piston rod 23 of an air cylinder 24 mounted on the frame 25 of the machine. Also secured to the support 22 and positioned therebeneath for vertical disposition therewith is an elongated, collar 26 slidably fitting on an upright follower member 27 secured to the air cylinder 24 in parallel relationship therewith. A crank 28 is pivotally received at one end thereof between a pair of parallel flanges 29 on the collar 26 and is pivotally connected at its other end to an arm 30. The arm 30 is keyed to a shaft 31 journaled in bearings, not shown, in the frame 25 to which the ends of a

pair of parallel arms or levers 32 are also secured to rotate about the axis thereof with the shaft 31. Pivotally connected to the other end of each lever 32 is a connecting link 33 pivotally mounted at its other end to an advancing bar 34 slidably disposed in channels 35 for movement reciprocably along a line of motion perpendicular to the line of motion of the pulldown rod 23. A positioning finger 36 is pivotally mounted on each advancing bar 34 at the forward end thereof for positively locating the blank 10 under the mandrel 19 in the manner to be set forth hereinafter.

A set of parallel chains 37 for transferring the blanks 10 from the magazine area to the vicinity of the mandrel 19 are disposed on sprocket wheels 38 that are drivingly connected with a spur gear 39. The spur gear 39 is turned by the output shaft and associated gearing of a speed reducer mechanism 40. A pair of lugs 41 are fastened to each transferring chain 37 for carrying the blank 10 forward under a plurality of glue heads 42 where a hot melt applicator associated therewith applies strips of adhesive 43 to the flaps 13' and 14 (FIG. 2) from a hot melt glue tank 44. Special limit switches 45 and 46 positioned between the glue applicators are provided with biased rollers for contacting the blank tray form 10 and detecting the thickness thereof. Limit switch 45 shuts off the machine till the trays are cleared if a double thickness is detected, as by more than a single tray being pulled from the magazine 17 by the pulldown assembly 18, and limit switch 46 prevents activation of the glue application circuit if no tray arrives at the gluing station. Another limit switch 47 on the frame 25 adjacent the chain drive 48 driven by motor 49 through reducer 40 is provided with a spring-biased roller 50 and is operably associated with the glue application circuit. Cutting off the application of glue for preventing the application of glue to the handholes 16 and the space between the flaps is accomplished by actuating the switch 47 with a cam 51 on the drive shaft 52 of the chain drive 48 having special skipping lugs L attached thereto.

Accordingly, stacked trays 10 in the magazine 17 are timestripped into the transferring chains 37 by the pulldown assembly mounted below the magazine 17. The transferring chains 37, through the lugs 41 thereon, carry the tray under the glue heads 42 and partially to the forming station, where the mandrel 19 is positioned. On the next reciprocation of the assembly 18, the positioning fingers 36 are retracted by links 33 to take over where the transfer chains 37 leave off and carry the tray 10 the rest of the way into the forming station under the elevated mandrel 19. The positioning fingers 36 move the blank 10 into the forming station until arrested by stops to make a switch 53 that activates the forming or mandrel cylinder 54 to cause the mandrel 19 to descend as shown in FIG. 4.

Referring now more particularly to FIGS. 4 and 6–9, the air-driven mandrel 19 is mounted on frame 25 above the path along which tray blank 10 is moved and is appropriately connected to piston rod 55 of cylinder 54 to be reciprocally movable along a vertical line of motion perpendicular to the line of motion along which the tray is transferred past the glue heads 42. As has already been explained, when the blank 10 engages and activates switch 53 the air cylinder 54 is activated to extend piston rod 55 downwardly and cause the blank 10 to be carried therewith to form the completed tray 10. As the blank 10 is moved downwardly by the mandrel 19, the leading sidewall 12 thereof is first engaged by a pair of leading flap folding guides 100 which are inclined downwardly from frame 25 toward the path of the mandrel 19 and then curved downwardly parallel to the desired path of the blank 10 with the leading sidewall 12 folded. The guides 100 cause the leading sidewall 12 to be folded up against the side of the mandrel 19 by bending along the creases or line 15 and is held thereagainst as best seen in FIG. 11. As the mandrel 19 continues to move the blank 10 downwardly the bottom of the blank 10 engages a first pair of leading flap folders 101 which fold the leading end flaps or first folded end flaps 13 integral with the sidewall 12 up against the sides of the mandrel 19 as seen in FIG. 11.

In the meantime, the trailing sidewall 12' of the blank 10 has been engaged by a pair of trailing folding guides 102 which fold the trailing sidewall 12' as the guides 100 fold the leading sidewall 12. As the mandrel 19 continues to move the blank 10 downwardly, the trailing end flaps 13' attached to wall 12' are engaged by a second pair of flap folders 105 which fold the end flaps 13' over the already folded leading end flaps 13. Since the lines of glue 43 have already been applied to the inside surface of the trailing end flaps 13', the glue attaches the already folded leading end flaps 13 to the new folded trailing end flaps 13'.

The mandrel 19 continues to move the partially formed tray 10 downwardly between compression plates 106 which have outwardly flared portions 108 that engage the end walls 14 attached to the bottom 11 of the tray 10 and fold them upwardly over the already folded trailing end flaps 13'. Since the lines of glue 43 have already been applied to the inside surface of the walls 14, the glue serves to attach the end walls 14 to the trailing end flaps 13'. The mandrel 19 continues to move the thusly formed tray 10 downwardly into the position shown in FIG. 4 so that the compression plates 106 press the flaps 13 and 13' and the walls 14 together until the glue has set thereby producing the formed tray 10.

The flap folders 101 and 105 are mirror images of each other. Therefore, only one of the flap folders 101 will be described in detail with primes of the referenced numerals applied thereto being applied to corresponding parts of the other flap folders. Referring specifically to FIGS. 8–10, it will be seen that the flap folder 101 includes a support 110 which is mounted on a transversely extending shaft 111 rotatably journaled in the frame 25, as seen in FIG. 7 and constantly urged in a counterclockwise direction as indicated in FIG. 9 by spring 112 shown in FIG. 7. The support member 110 has a U-shaped transverse cross section as best seen in FIG. 8 with an inner wall 114 and an outer wall 115 joined by web 113 defining a recess 116 extending along the length thereof.

A folding assembly 120 is mounted at the upper or outwardly extending end of the support member 110 adjacent the inner wall 114 thereof. The flap-folding assembly 120 is mounted on a U-shaped support bracket 121 having a pair of mounting spaced legs 122 which extend above or inwardly of the inner wall of the support 110. Pivotally mounted between the legs 122 is an L-shaped arm 124 having a long flap folding leg 125 and a short camming leg 126. Arm 124 pivoted about cropp-pin 128 extending through pivot block 129 carrying the arm 124 and the legs 122 of the mounting bracket 121. The arm 124 is adapted for pivotal movement between a closed position shown in solid lines in FIG. 8 and an open position shown in dashed lines in FIG. 8. As the arm 124 moves from its open position to its closed position, it folds one of the end flaps 13 of the tray blank 10.

For maintaining the arm 124 in its open position or its closed position, a spring 130 is provided which extends between the pivot block 129 and the mounting bracket 121 in such a manner that when the arm 124 is forced into its closed position it will be maintained in that position because the pin 131 connecting the spring 130 to the pivot block 129 lies on the left side of the pivot pin 128 as is seen in FIG. 8. On the other hand spring 130 will force the arm 124 toward its open position once the arm 124 is shifted so that the pin 131 lies to the right of the pivot pin 128 as shown by the dashed lines in FIG. 8. In this manner, once the arm 144 is shifted to either position, it will be held there under the influence of spring 130. When the support 110 is pivoted counterclockwise as shown in FIG. 9, a cam 132, best seen in FIGS. 8 and 10, will extend through an appropriate aperture 134 through support 110 and opening into recess 116 to engage the edge of a depending cam 135 on cam leg 126 of arm 124 and move the arm 124 sufficiently far clockwise as seen in FIG. 8 to cause the arm 124 to be moved to its open position. This takes place when the mandrel 19 is moved upwardly from between the flap folders 101 and 105 and the arm 124 will remain in this position until the mandrel 19 again is moved downwardly carrying a tray blank 10 therewith. As the mandrel 19 moves

downwardly, the sidewall 12 engages the cam 135 of the cam leg 126 and cause the arm 124 to pivot to its closed position while folding one of the end flaps 13 by the flap-folding leg 125.

As the mandrel 19 moves downwardly, carrying the tray blank 10 therewith, the support 110 is pivoted clockwise against the spring 112 by the blank 10 engaging a driving plate 136 carried by the support 110 and extending therebelow as seen in FIG. 4. It is the combined action of the pivoting of the support 110 about the shaft 111 and pivotal mounting of the arm 124 that causes the arm 124 to move from its open position to its closed position while at the same time causing the flap 13 to be folded against the mandrel 19. The driving plate 136 is of sufficient length that the mandrel 19 will cause the formed tray 10 to be displaced below the lower end thereof when it is in final compression position between the compression plates 106 so that the driving plate 136, under the influence 112 is pivoted inwardly against the side of the mandrel 19 as best seen in FIG. 14 so that, when the mandrel 19 begins its ascent, the lower edge of the plate 136 will engage one side of the formed tray 10 and cause it to be stripped from the mandrel 19 in conjunction with the complimentary plates of the trailing flap folding assemblies 105 as set forth hereinbelow. The driving plates 136*a* of the trailing flap folders 105 as seen in FIG. 4 are shorter than the corresponding driving plates 136 and 136′ of the flap folders 101 so that when the flap folders 101 and 105 are pivoted to a substantially vertical position is seen in FIG. 14, the lower ends of the plates 136, 136′ and 136*a* lie in substantially the same horizontal plane. In this manner, it will be seen that these plates engage the top of the formed tray 10 and strip the same from the mandrel 19 as it ascends. The tray 10 is held between the compression plate 106 until the next tray 10 is formed and occupies the position shown in FIG. 4. This causes the first formed tray 10 to be discharged below the compression plates 106 onto a suitable conveyor (not shown) to be moved out of the machine. Since the glue applied to the flaps 13′ and end walls 14 of the tray 10 is of the hot glue or quick setting type, the length of time that the tray 10 is held between the compression plates 106 is sufficient for the glue to set up and the finally discharged tray 10 will be ready for use.

From the foregoing description it will be seen that the sidewalls 12 and 12′, the end flaps 13 and 13′, and the end walls 14 are all folded to form the final tray 10 upon reciprocation on mandrel 19. Thus, the mandrel 19 serves as the only external power source that is needed to completely form each tray 10.

In FIG. 15, there is shown a special selector valve assembly 150 that may be provided if desired should the operator wish to keep the machine operating without running trays therethrough. In the position shown, the vacuum is activated by cam 151 on shaft 31 through valve 91. When the handle 152 connected to a secondary cam 154 is rotated counterclockwise as seen in FIG. 15 to its manual position, it prevents cam follower 155 from contacting cam 151 and shuts off the vacuum to the pulldown assembly 18.

FIG. 16 is a schematic of an electrical circuit for controlling the machine disclosed herein and shows the main drive motor 49 and a vacuum pump motor 73 belted thereto connected with parallel circuits for the hot melting applicator, the hot melt heaters and the mandrel or forming head cylinder. The glue applicator limit valves 46 and 47 are shown in the normal closed positions. Limit valve 46 is normally in the open position, which is the case when no tray blank is in the glue application area. Other limit valves 53 actuated by the tray blank 10 fully positioned under the mandrel for starting the mandrel downward and 74 for initiating retraction of the mandrel are shown operatively connected to solenoids 76 and 77 for moving a pneumatic valve 78 to effect the operation of the air-driven mandrel 19.

FIG. 17 is a schematic of a typical pneumatic circuit for the present machine and shows a main fluid line 80 leading from an air supply under pressure to the system. Line pressure 80 feeds to a line 81 for actuating an air cylinder 82 of a spring-biased valve 83 and to a line 84 to the inlet of the valve 83. A cam-actuated valve 85 is disposed in the line 81. Two outlet lines 86 and 87 from the valve 83 lead to the pulldown assembly actuating cylinder 24 for controlling the stripping of tray blanks 10 from the magazine 17. The vacuum for the cups 21 of the pulldown assembly 18 is provided by pump 73 which is connected thereto through a spring-biased valve 88 having an inlet line 89 and an outlet line 90 and actuated by the application of line pressure 80 thereto through a cam-actuated valve 91 and a fluid line 92 therebetween.

Application of the hot melt 42 through a cylinder thereof is controlled by admitting line pressure 80 thereto through a solenoid-actuated valve 93 and through outlet lines 94 and 95 therefrom to one side of the cylinder.

Reciprocable motion of the mandrel 19 is accomplished by moving a piston 96 within the cylinder 54. Such motion is achieved by the alternate and successive admission of line pressure 80 through a valve 78 actuated by solenoids 76 and 77 to lines 97 and 98 leading to both sides of the cylinder 54.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as described herein.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In a machine for automatically setting up shipping trays from blank forms, the combination comprising:

a magazine for storing a supply of said tray blanks for said machine;

means for removing said tray blanks one at a time from said magazine;

glue-applying means for selectively applying glue to predetermined portions of said tray blanks;

indexing means for advancing tray blanks past said glue-applying means to a tray-forming station; and

means disposed at the tray-forming station for folding the side panels of said tray at right angles to the tray bottom and successively folding the end flaps of one of said folded panels, the end flaps of the other of said folded panels and the end flaps of said tray bottom in overlapping relation and at right angles to said folded side panels and said tray bottom, said tray-forming station comprising;

a mandrel having a configuration substantially like that of the tray blank when set up, and being movably disposed in a reciprocable path perpendicular to the plane of said tray blank received at said tray-forming station, said mandrel being positioned to engage said tray blank on the bottom panel thereof upon movement in one direction;

means on one side of said mandrel path for engaging a side panel of said tray blank and folding said side panel against the mandrel when said mandrel and said tray blank are moved thereby;

means on the other side of said mandrel path for engaging the opposite side panel of said tray blank and folding said opposite side panel against the mandrel when said mandrel and said tray are moved thereby;

a pair of flap folders disposed on said side panel engaging means for folding the end flaps of said side panel about the mandrel ends;

another pair of flap folders disposed on said opposite side panel engaging means for folding the end flaps of said opposite side panel about the mandrel ends overlapping the flaps of said side panel; and

means on the end sides of the mandrel path for engaging the end flaps of the tray bottom and folding said end flaps about the mandrel ends overlapping the folded end flaps of said opposite side panel;

each of the flap folders which fold the end flaps of the side panels comprising;

a mount having an opening therein;

a flap arm pivotally disposed on said mount, said flap arm being alternately movable to one or the other of two positions and having a projecting cam surface at one end thereof movable in said opening in said mount when said arm is caused to move from one position to the other;

and biasing means secured to said mount and said arm for alternately biasing said arm to one or the other of said two positions.

2. The machine of claim 1 wherein said side panel engaging means and said opposite side panel engaging means are pivotally disposed about axes perpendicular to the path of movement of said mandrel, whereby said flap folders disposed thereon may be moved into and out of engagement with said mandrel upon movement thereof in one direction and movement in the other direction respectively; and

means for contacting said cam surfaces of said flap arms upon movement of said mandrel in said other direction for pivoting said flap arm.

3. The machine of claim 1 wherein said tray blanks are stored in said magazine stacked upon one another; and

said means for removing said tray blanks from said magazine comprises a pulldown assembly for successively removing the lowermost tray blank from said stack along a line of motion perpendicular to the plane thereof.

4. The machine of claim 3 wherein said tray blank removing means comprises vacuum cup means for engaging the blanks successively.

5. A machine as in claim 1 further comprising a limit switch for stopping the machine if two or more tray blanks arrive simultaneously at the glue-applying means.

6. A machine as in claim 1 further including a limit switch for stopping the machine if no tray blank arrives at the gluing means at the appointed time.

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