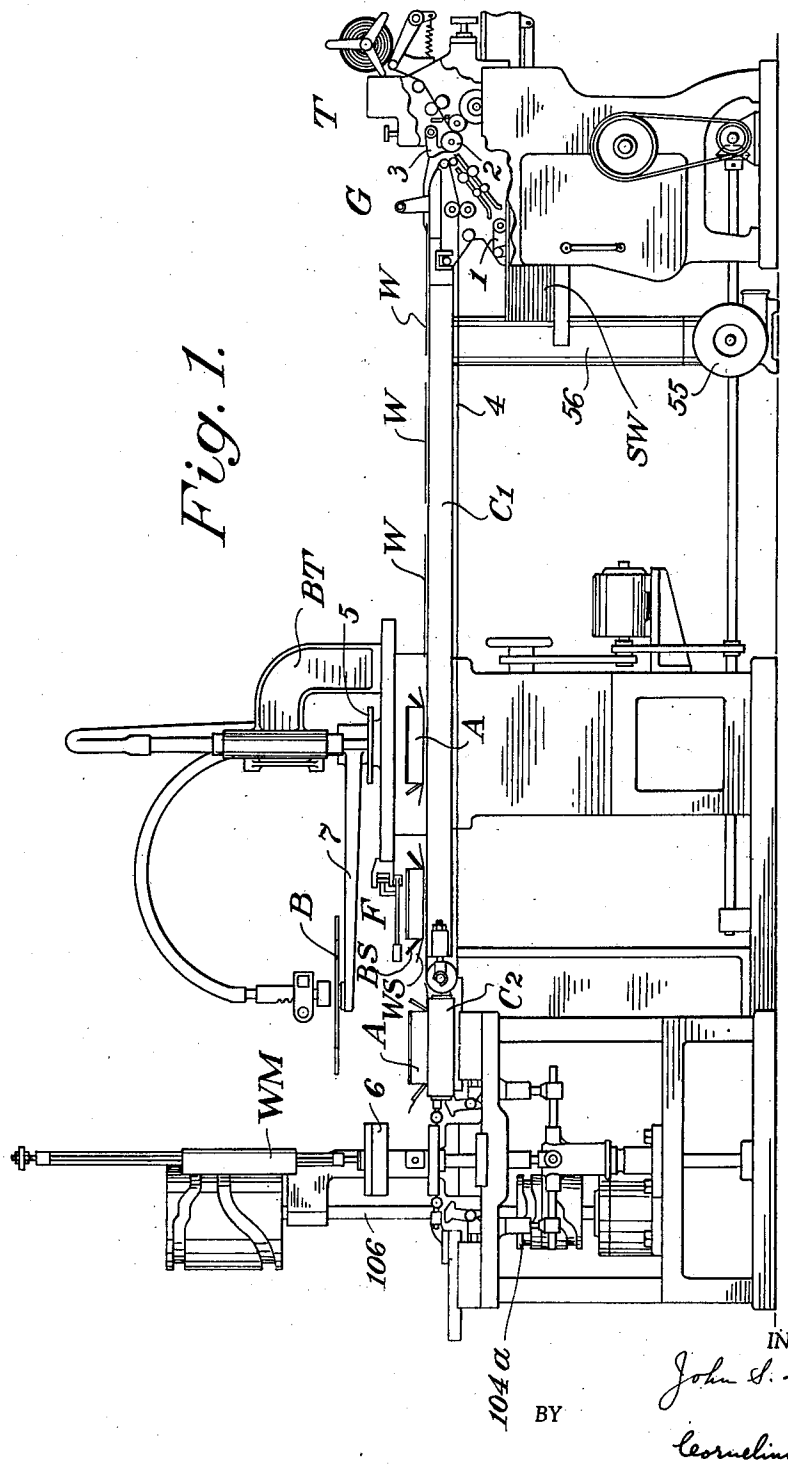
April 4, 1939. J. S. STOKES 2,152,775

SYSTEM FOR MAKING AND/OR WRAPPING BOXES

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Fig. 1.



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SYSTEM FOR MAKING AND/OR WRAPPING BOXES

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Fig. 2.

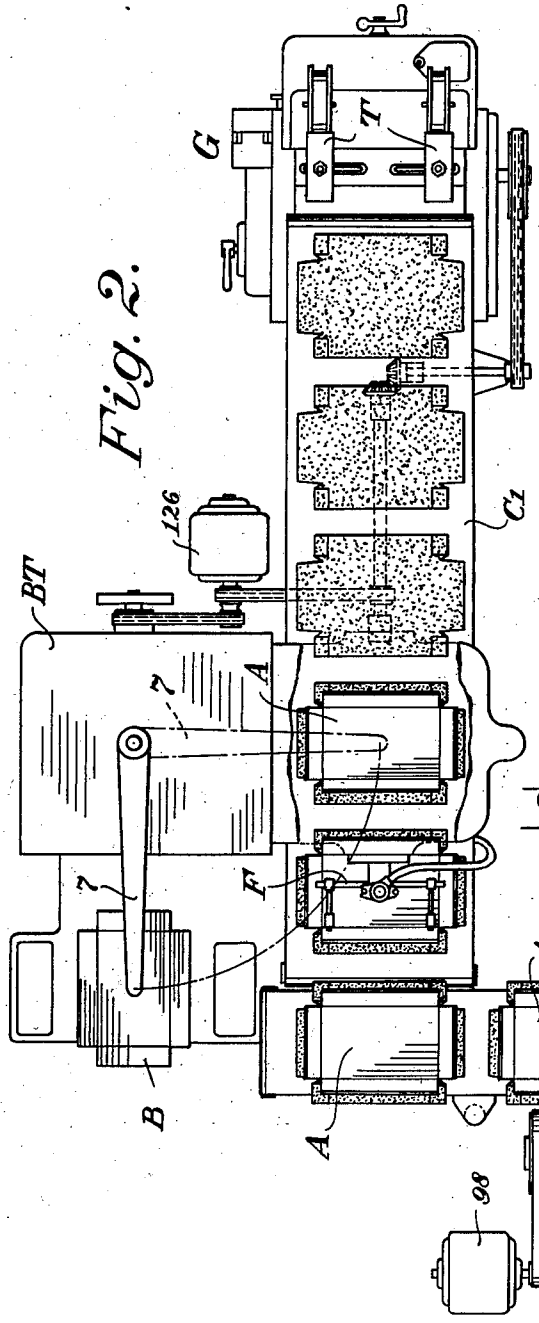
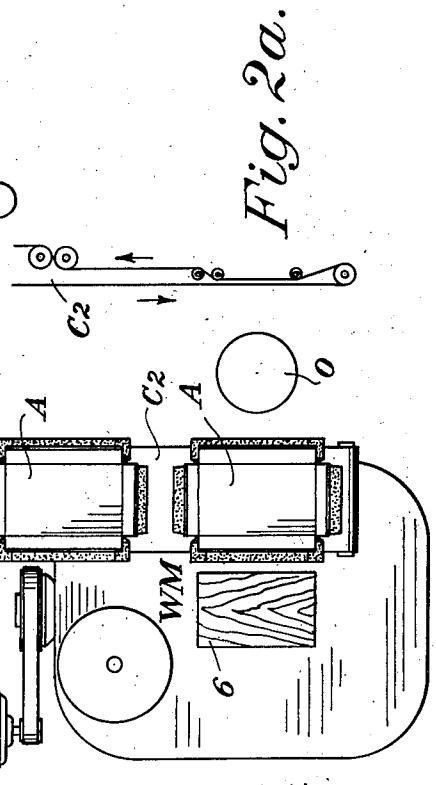


Fig. 2a.



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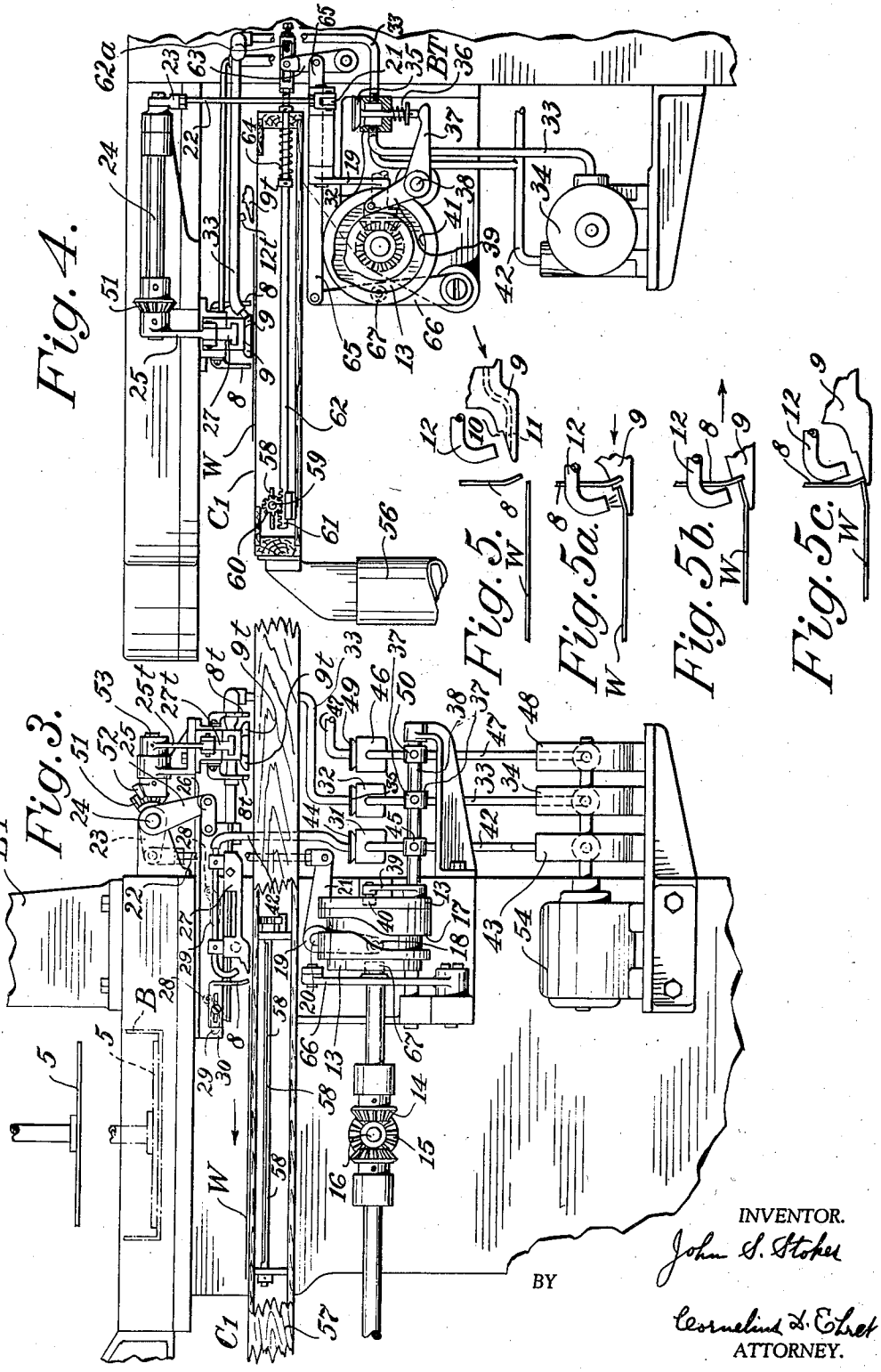


Fig. 4.

Fig. 3.

Fig. 5. Fig. 5a. Fig. 5b. Fig. 5c.

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SYSTEM FOR MAKING AND/OR WRAPPING BOXES

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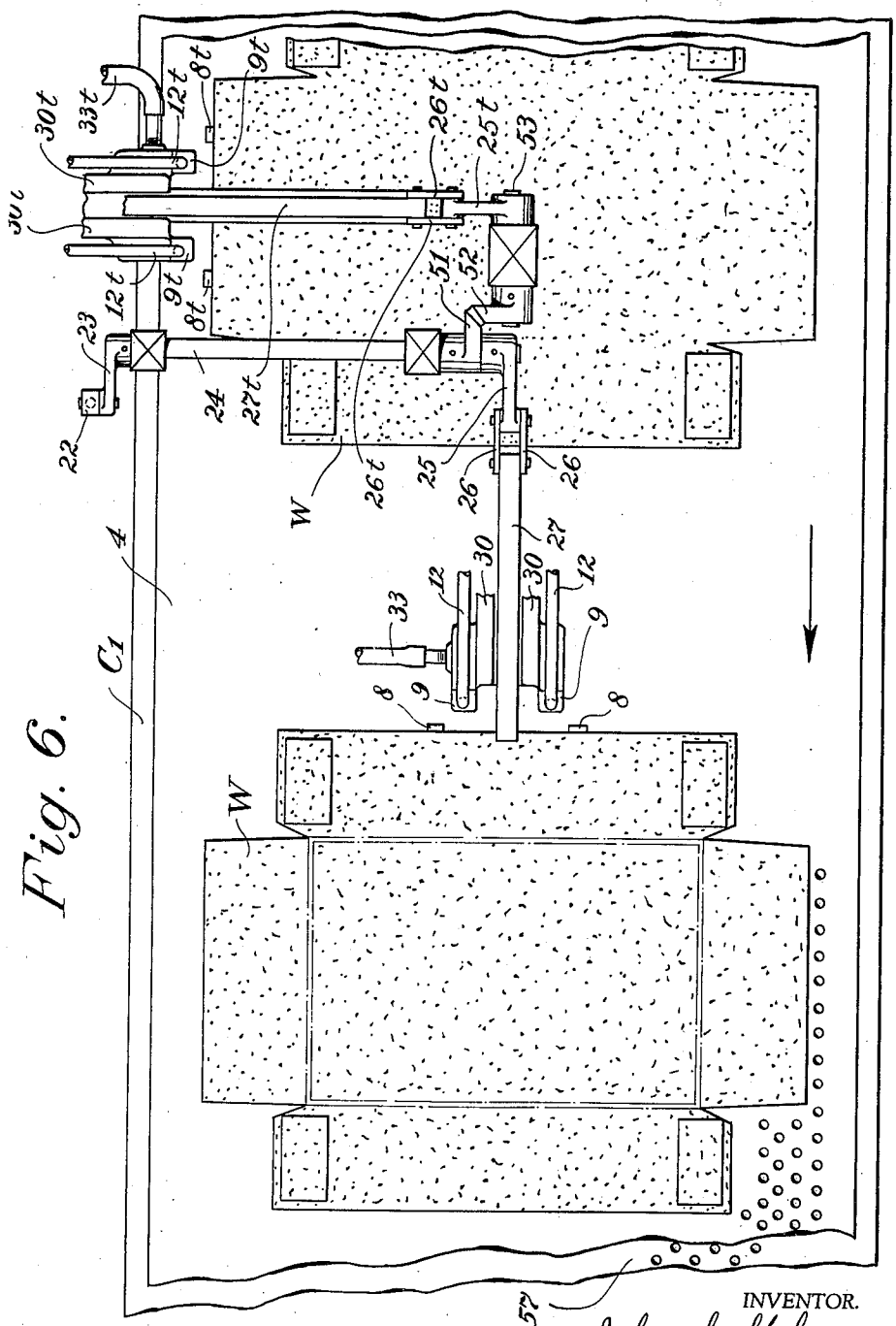


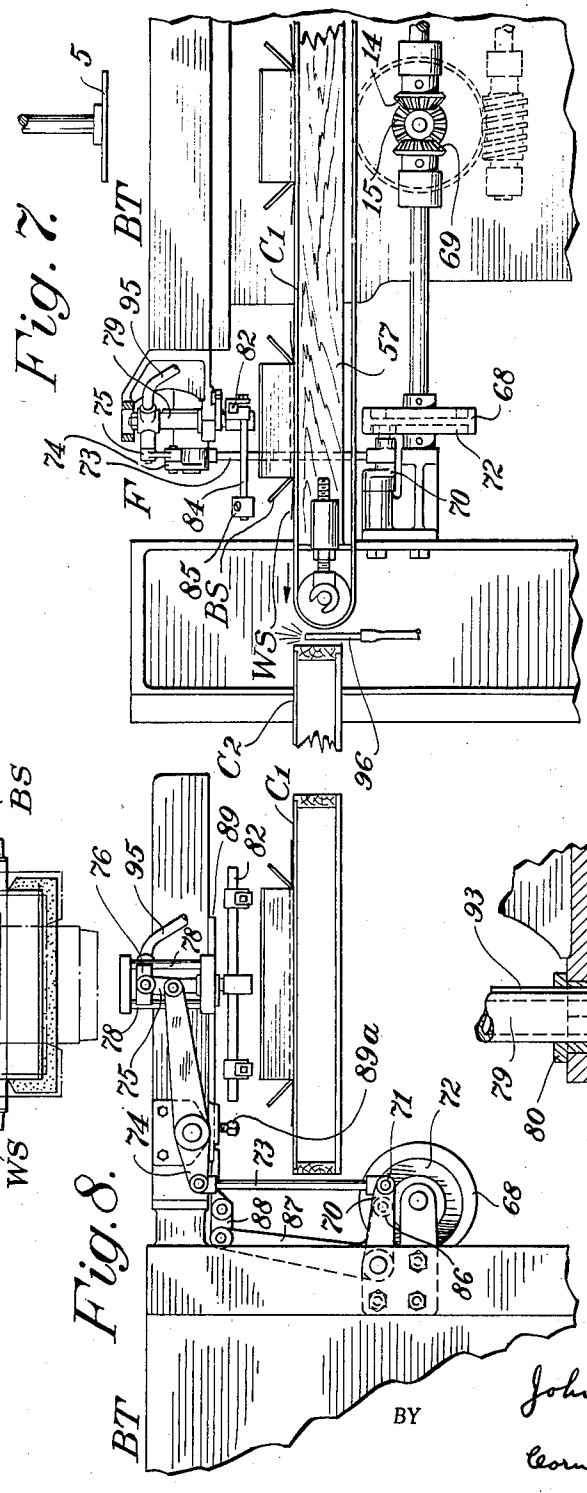
Fig. 6.

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SYSTEM FOR MAKING AND/OR WRAPPING BOXES

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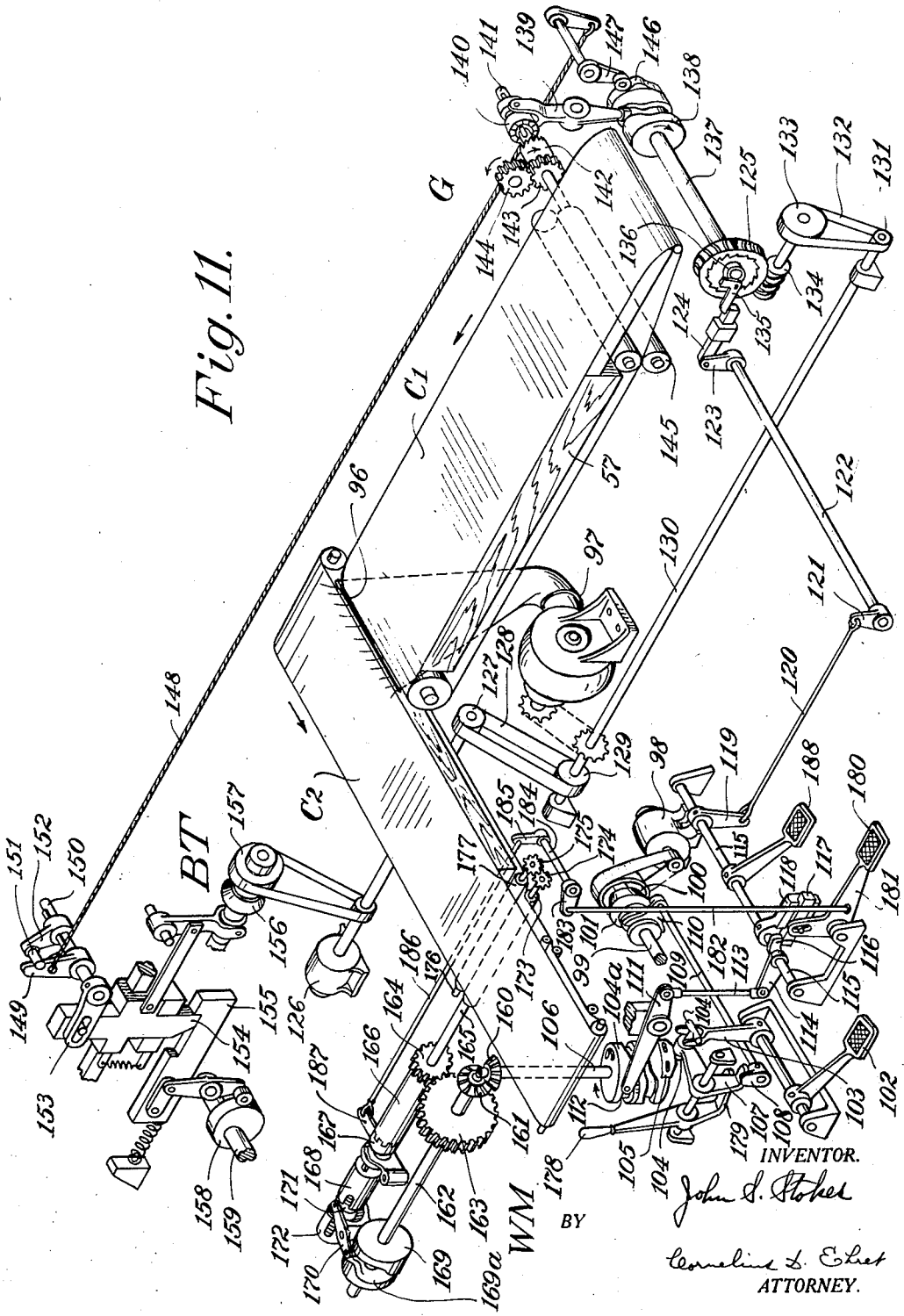
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SYSTEM FOR MAKING AND/OR WRAPPING BOXES

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Fig. 11.



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SYSTEM FOR MAKING AND/OR WRAPPING BOXES

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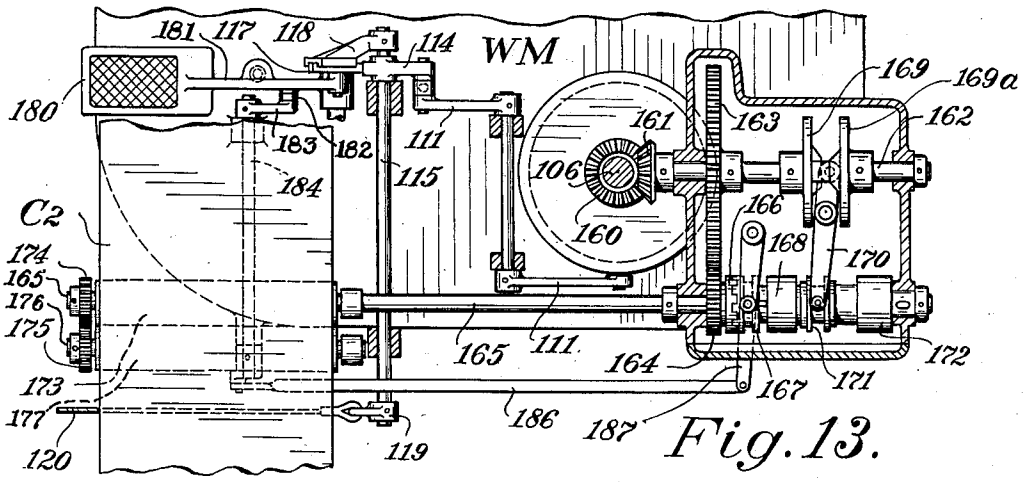


Fig. 13.

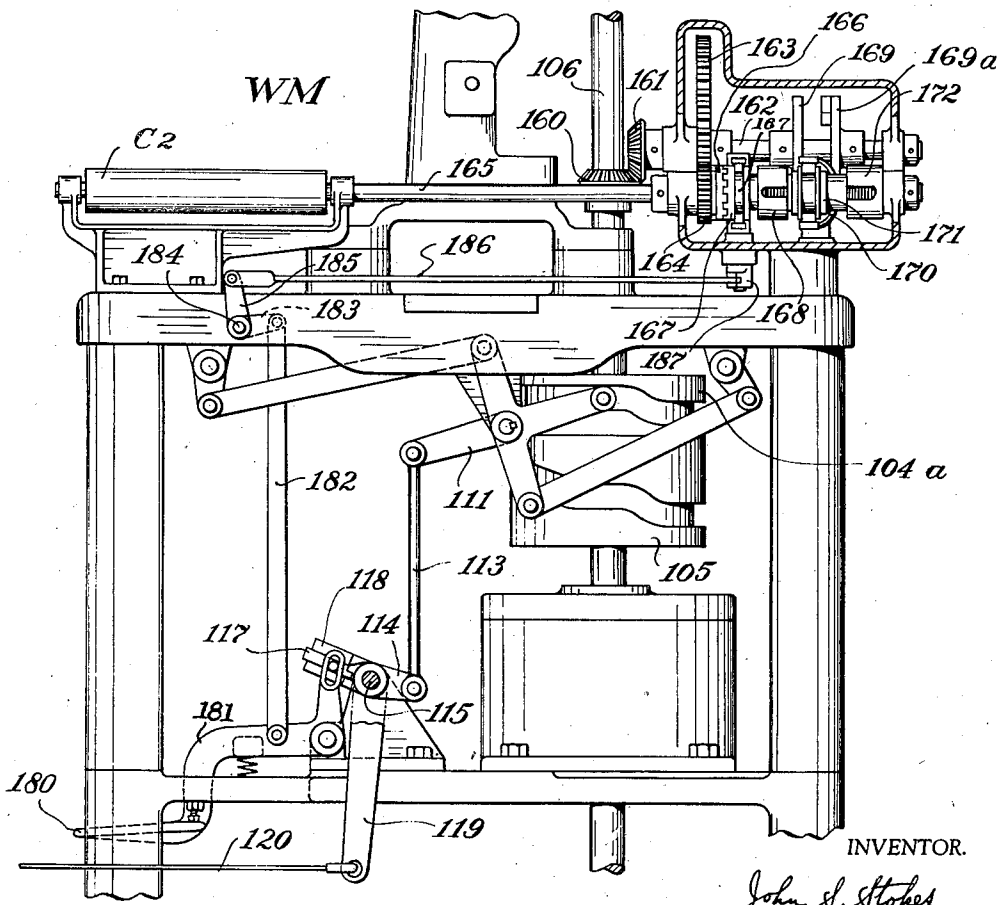


Fig. 12.

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SYSTEM FOR MAKING AND/OR WRAPPING BOXES

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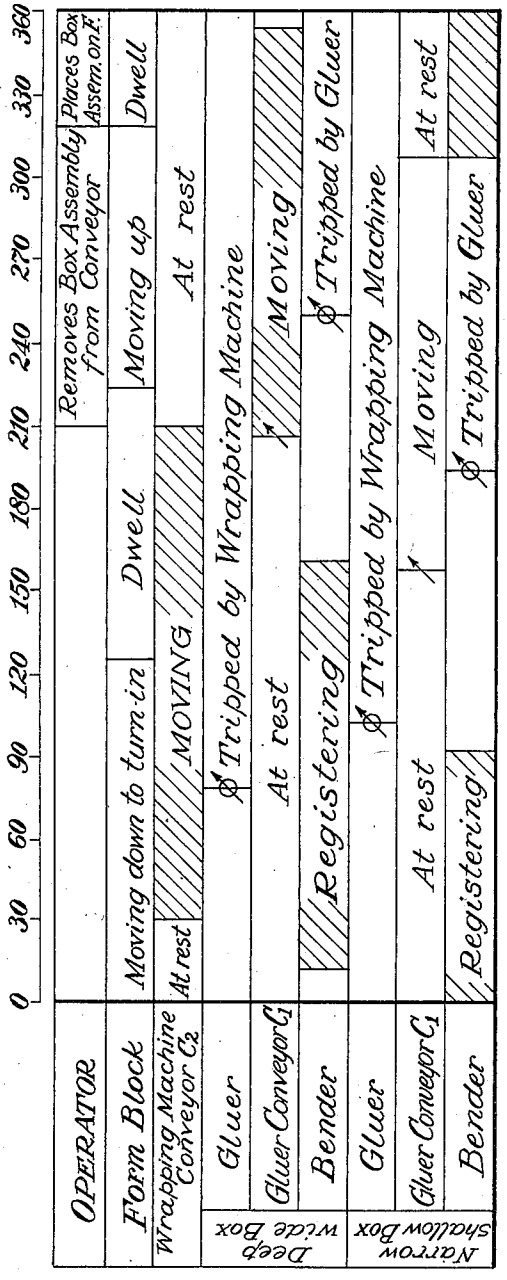


Fig. 14.

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Patented Apr. 4, 1939

2,152,775

UNITED STATES PATENT OFFICE

2,152,775

SYSTEM FOR MAKING AND/OR WRAPPING BOXES

John S. Stokes, Huntingdon Valley, Pa., assignor to Stokes and Smith Company, Summerdale, Philadelphia, Pa., a corporation of Pennsylvania

Application January 18, 1937, Serial No. 121,117

35 Claims. (Cl. 93—54.2)

My invention relates to systems for making and/or wrapping boxes, box covers, containers, and the like, herein generically termed "boxes".

In accordance with one aspect of my invention, mechanisms operating in timed relation to wrapping or sheet-applying mechanism effect coating of wrappers, labels, or the like, with adhesive, transfer of the coated wrappers to an assembly station for engagement with box structure, specifically a box blank or unstayed box, and transport of the assemblies toward the wrapping mechanism.

More particularly, a conveyor which transports the assemblies from the assembly station transfers or delivers them onto another conveyor which transports them adjacent to the form block structure of the wrapping mechanism; preferably, a directed current of air or air-blast is utilized to prevent substantial dropping of the wrappers as they pass, during transfer from one conveyor to another, over a gap between them.

Further in accordance with my invention, mechanism may be provided to rotate the box-wrapper assemblies through a partial revolution to permit either endwise or lengthwise feed of the wrappers to the assembly station and yet always procure endwise feed of the assemblies toward the wrapping station.

My invention also resides in provision of means for changing the timing relations between the component mechanisms of the system to obtain the same high output, whether the box structures be small or large.

My invention also is concerned with the provision of a control which permits an operator, without interruption of operation of the machine, to prevent feeding and coating of wrappers for one or more cycles of the machine, and concurrently to prevent delivery of one or more assemblies to the wrapping station.

My invention further resides in the features of construction, combination and arrangement hereinafter described and claimed.

For an understanding of my invention and for illustration of a preferred embodiment thereof, reference is to be had to the accompanying drawings in which:

Fig. 1, in side elevation, with parts omitted and parts broken away, illustrates a complete box-forming machine or system;

Fig. 2 in plan, with parts omitted and parts broken away, illustrates the machine or system of Fig. 1;

Fig. 2a is a detail view in side elevation of conveyor structure shown in Figs. 1 and 2;

Fig. 3 is a detail view, on enlarged scale and partly in section, of wrapper registering mechanism;

Fig. 4 is an end elevational view of parts appearing in Fig. 3;

Figs. 5, 5a, 5b, 5c are detail views, on enlarged scale, illustrating the wrapper registering operation;

Fig. 6 is a plan view of wrapper registering mechanism shown in Figs. 3 and 4;

Fig. 7 is a detail view, in side elevation, of mechanism shown in Fig. 1;

Fig. 8 is an end elevational view, partly in section, of mechanism of Fig. 7;

Fig. 9 is a plan view, illustrative of the operation of mechanism of Figs. 7 and 8;

Fig. 10, in cross-section and on enlarged scale, is a detail view of assembly rotating mechanism of Figs. 7–9;

Fig. 11 schematically illustrates, in perspective, the significant components of the control system of the complete machine or system of Fig. 1;

Fig. 12, on enlarged scale, with parts omitted and parts in cross-section, shows control mechanism of conveyor structure shown in preceding figures;

Fig. 13 is a plan view, partly in section and with parts broken away, of Fig. 12;

Fig. 14 is a timing diagram referred to in explanation of the adjustments adapted to the systems of Figs. 1 and 2 for different sizes of boxes.

Referring to the systems of Figs. 1 and 2, the wrapper feeding and coating mechanism G, generally of the type disclosed in Federwitz Patents Nos. 1,772,344 and 1,770,483, includes a suction member I for lifting wrappers W, one at a time, from the top of the stack SW and feeding them into engagement with the roll 2 for application of a coating of adhesive. The wrappers are deflected from the coating roll, as by the stripper blades 3, which deflect them on to the receiving end of a conveyor C1 preferably of the suction type such as disclosed, for example, in Davis Patent No. 1,818,198.

If desired, tabs may be applied to the wrapper substantially concurrently with application of adhesive thereto, as by tabbing mechanism T, preferably of the type disclosed in Rider Patent No. 1,806,181; or, if desired, only tabs may be delivered to the conveyor in accordance with my application Serial No. 37,162, filed August 21, 1935, upon which has issued Letters Patent 2,111,157.

The conveyor belt 4 moves the coated wrappers, step by step, one step for each cycle of the gluer mechanism G. When the conveyor is at rest, mechanism, hereinafter described, registers a wrapper below the plunger 5 of mechanism BT, preferably of the type disclosed in Stokes et al. Patent No. 2,018,237. The plunger 5 transports a box structure B, specifically a box blank, into registered engagement with the registered wrapper, to form an assembly A.

Subsequently, the conveyor C1 transports the assembly below the mechanism F, hereinafter

specifically described, which flattens the panel BS of the blank onto the corresponding wrapper panel WS.

As more clearly appears in Fig. 2, the delivery end of the conveyor C1 is closely adjacent the side of a conveyor C2 which extends to a region adjacent the path of movement of the form block 6 of a box machine WM, preferably of the type disclosed in Federwitz Patent No. 2,044,606 or Rider et al. Patent No. 2,058,036.

The assemblies, in turn, are transferred from the conveyor C2 automatically, or preferably, as in the system specifically illustrated, by an operator at O, onto the form block 6 of the box wrappering and/or forming machine WM during that portion of the wrapping machine cycle when the form block is accessible to receive a box. During downward movement of the form block from the position shown in Fig. 1, the wrapper is applied, as described in aforesaid Rider et al. Patent No. 2,058,036, to form a wrapped box which, during upward or return movement of the form block, is stripped therefrom and discharged from the machine by an ejector.

For one cycle of the complete machine, assuming wrapped boxes are to be made, a wrapper is fed from stack SW, coated with adhesive, and deposited on the conveyor belt 4; a wrapper is registered below the plunger 5 of mechanism BT; arm 7 of mechanism BT effects transfer of a box blank to plunger 5; plunger 5 effects registration of a blank upon a registered wrapper; mechanism F flattens the side panel of another assembly onto the corresponding wrapper panel of that assembly; an assembly is transferred beyond mechanism F by conveyor C1 onto conveyor C2; an assembly is brought by conveyor C2 adjacent the form block and operator of the wrapping machine WM; and an assembly is disposed upon the form block of the wrapping machine WM, converted into a wrapped box, and ejected.

The mechanism for effecting register of wrappers upon the conveyor C1 below the plunger 5 of the mechanism BT is shown in Figs. 3 to 6 inclusive. Each wrapper, in turn, is transported by the belt 4 to a position of approximate register preferably somewhat beyond the position of exact register defined by the adjustment of stop structure 8. This position of approximate register will vary for different wrappers during running of the machine, hence the need for accurate register of the individual wrappers. While the wrapper is at rest, the shoe structure 9, normally sufficiently above the surface of the conveyor C1 to clear the wrapper W, is moved downwardly and to the left, as viewed in Fig. 3, by mechanism hereinafter described, to depress the conveyor belt, to lift the edge of the wrapper, as more clearly appears in Fig. 5*a*, and to move the wrapper forward. As more clearly appears in Fig. 6, the registering structure actually comprises two shoes 9 suitably spaced transversely of the belt 4 and movable as a unit. Consequently, if the wrapper is askew on the conveyor, the shoulder 10 of one or the other of the shoes 9 will first engage the wrapper edge and swing it parallel to the side edge of the transfer plunger 5. The spacing between the adjustable stops 8 is sufficiently great to permit the shoes to pass between the stops in their forward movement to the position shown in Fig. 5.

Preferably, the shoes 9 are provided with ports 11 through which suction is applied to hold the edge of the label against the shoes 9 during their forward movement, and additionally, there may be provided nozzles 12 for directing an air-blast against the upper surface of the portions of the wrapper edge engaged by the shoes 9. The suction and air-blast insure movement of the label bodily with the registering shoes 9. When, during reverse movement of the shoes 9, the raised edge of the wrapper is engaged by the stop structure 8, Fig. 5*b*, the stops 8, 8 are effective to preclude further movement of the wrapper as the shoes 9 continue their movement to the right, Fig. 5*b*, the wrapper being, in effect, stripped from the shoes, as shown in Fig. 5*c*, leaving the wrapper at the position of exact register defined by the stop structure 8. Preferably, and by mechanism hereinafter described, the application of suction and air-blast to the wrapper is discontinued about the time the raised wrapper edge engages stop structure 8.

At a station prior to the one at which the wrapper is registered longitudinally of the conveyor, as immediately above described, the wrapper is registered transversely of the conveyor by mechanism similar to that described for effecting longitudinal register and identified by the same reference characters but with addition of subscript *t*.

In the particular arrangement described, concurrently with registration of one wrapper longitudinally of the conveyor, another wrapper is being registered transversely of the conveyor by a generally similar mechanism. The common operating mechanism for the two registering devices is now described.

The cam 13, Figs. 3 and 4, is driven, as by gears 14, 15, from shaft 16, which makes one revolution during the cycle of mechanism BT. The cam groove 17 of cam 13 receives the follower 18 at the end of lever 19 secured to shaft 20 to which is also secured a lever 21. The link 22 is connected at its lower end to lever 21 and at its upper end to an arm 23 suitably secured to shaft 24 to which is connected lever arm 25 connected by links 26 to the slidable member 27 provided with the wrapper-engaging shoes 9, above described. The slide 27 is provided with pins or rolls 28 received by slots 29 in the stationary guide members 30.

When the parts are in the position shown in Fig. 3, the shoes 9 are elevated to prevent any obstruction to movement of the wrappers by the conveyor; when arm 25 is moved to the left under the control of cam 13, the rolls 28 and slots 29 provide for downward movement of slide 27 concurrently with its movement to the left. Accordingly, the shoes 9 operate, as above described, to raise the right edge of the wrapper W from the conveyor surface, and move it more or less to the left from its position of approximate register. During this movement of the slide 27, the air-blast through nozzles 12, and the suction through shoes 9 become effective under the control of valves 31, 32.

The valve 32 is a bleeder valve in the line 33 from the ports 11 of shoes 9 to the suction side of the pump 34. The movable valve member 35, biased to closed position by the spring 36, is operable by the lever 37 secured to shaft 38 to which is also secured the arm 39 which carries the follower 40 received by the groove 41 of cam 13. The valve 31 is a bleeder valve in the line 42 connecting the nozzles 12 to the outlet side of the blower or pump 43. The movable member 44 of the valve is operable by lever arm 45 secured to shaft 38. This same valve 31 also controls the blast to the nozzles 12*t* associated with the mechanism for transverse register of the wrapper. The valve 46 for controlling the suction exerted through the ports 11*t* of shoes 9*t* of the transverse

registering mechanism is of similar construction to valves 31 and 32; it is interposed in the line 47 between the ports 11t and the suction side of the pump 48; its movable member 49 is operable by the arm 50 secured to shaft 38.

The to and fro movement of shaft 24 for effecting registration of a wrapper longitudinally of conveyor 4 is utilized to effect transverse registration of another wrapper; the gear sector 51 secured to shaft 24 is in mesh with the gear sector 52 on shaft 53 to which is attached arm 25t connected by links 26t to slide 27t which, for clockwise movement of shaft 24, is moved downwardly and toward the center line of the conveyor belt 4 and which, for reverse movement of shaft 24, is moved upwardly and toward the edge of the belt to effect transverse movement of the wrapper W to the position of exact transverse alignment defined by the stops 8t. Because the mechanism for effecting this transverse alignment is identical with that for effecting the longitudinal alignment, its construction and mode of operation need not be specifically described.

It is not necessary that three pumps 34, 43 and 48 be provided; a single pump driven by the motor 54 may be utilized.

During transport of the wrappers from the gluing mechanism G to the assembly station, exemplified by mechanism BT, they are preferably subject to suction supplied by pump 55 connected as by duct 56 to a housing 57 having a perforated upper surface over which the belt 4 passes. The suction holds the wrappers flat against belt 4 and prevents curling incident to drying action of the adhesive. It is desirable this suction be cut off or reduced during the longitudinal and transverse registering movements of the wrappers. To that end, the portion of the housing at the registering stations is substantially isolated by transverse partitions extending nearly across the width of the conveyor to form a chamber whose communication with the rest of the suction housing is controllable by the valve member 58 secured to shaft 59 having thereon a gear 60 in mesh with the rack 61 on the member 62 which extends externally of housing 57 and is connected to the lever arm 63. The valve is biased to open position as by spring 64. Member 62, externally of the suction housing, is slotted to receive an abutment on arm 63 which, during oscillation of the arm, engages the adjustable stop 62a. The lever arm 63 is connected as by link 65 to the arm 66 which carries the cam follower 67 maintained in engagement with cam 13 by spring 64.

Preferably, the valve 58 is so timed that suction in this compartment is "off" or reduced during the longitudinal and transverse registering operation and is restored before the box-blank is registered on the wrapper below plunger 5.

By adjustment of stop 62a, the amount of reduction of suction for registration of the wrapper can be regulated to suit the particular papers and adhesives; in general, the suction during registration should be sufficiently strong to prevent curling of the wrapper due to action of the adhesive, and yet not so strong as to impede movement of the wrapper as a whole by the registering mechanism.

At the assembly station the plunger 5 effects adhesive engagement between the bottom panel of a blank and the corresponding panel of a wrapper registered below the plunger. The side and end panels of the wrapper are held flat by suction against the conveyor preferably before, during and after registration of a blank thereon. The side and end panels of the blank, due to the natural resiliency of the box material, remain out of engagement with the corresponding wrapper panels.

It is desirable that the box side panel and wrapper side panel, which will lead when the assembly is fed to the form block of the wrapping machine, be brought into adhesive engagement prior to that time. The mechanism for effecting that engagement, as shown in Figs. 7 and 8, is now described.

The cam 68 is driven from gears 15 and 69 to make one revolutiton for each cycle of the mechanism BT. The lever arm 70 carries a cam follower 71 received by the groove 72 of cam 68; the link 73 is connected at its lower end to arm 70 and at its upper end to one arm 74 of a lever whose other arm is connected by link 75 to a cross head 76 guided for vertical movement by bars 78. A member 79, movable with the cross head 76 and which passes through the bushing 80 in the frame member 81 is provided at its lower end with the cross bar 82 from which extend the bars 84 to the outer ends of which are adjustably secured the flap-engaging members 85. The mechanism is so timed that when an assembly is below the flap-sticking mechanism F the cam 68 effects reciprocation of the rod 79 so that the members 85 engage the wrapper panel BS and flatten it upon the wrapper panel WS.

To adapt the system for a wide range in sizes of boxes, it is desirable that the wrappers be fed either endwise or sidewise by conveyor C1, depending upon the wrapper dimensions. However, it is desirable that the wrappers, as delivered to the wrapping machine, always be in such position that a side panel of the wrapper is presented to the form block, as appears in Fig. 2. Accordingly, there is provided mechanism which may be utilized to rotate wrappers on conveyor C1 through approximately a quarter revolution. The cam 68 is provided with a second groove or cam surface which engages the cam follower 86 at one arm of the bell-crank lever 87 whose other arm is connected by link 88 to a reciprocable bar 89 having a pin 90 received in the slot 91 of an arm 92 attached to or integral with the bushing 80. Accordingly, cam 68 is effective through the train of mechanism described to effect an angular movement of the rod or member 79 which, as above described, is movable toward and away from the conveyor C1 to flatten box panel BS.

When the member 79 is at the bottom of its stroke, it is in engagement with the box blank, and suction is exerted thereon through the open end of the suction head 94 at the lower end of member 79 and in communication with a suitable source of suction, as through the hollow tubular member and the flexible hose 95. When it is desired not to rotate the assembly, this mechanism is, of course, disabled, as by disconnecting link 88 from bar 89 or in any other suitable way, and securing the latter in desired position by set screw 89a.

The next step of the conveyor C1, which occurs while the conveyor C2 is at rest, effects transfer of an assembly below the mechanism F onto the conveyor C2. To prevent any of the leading edges of the various wrapper panels of the assembly from striking the side of the conveyor C2, whose upper surface is in substantially the same plane as the surface of conveyor C1, there is provided a directed current of air, specifically an air-blast, in the gap between the conveyors to prevent any of the wrapper panels from drooping as they pass from one conveyor to the other. Specifically, as

appears in Figs. 7 and 11, the nozzle 96 extends substantially the entire length of the gap between the delivery end of the conveyor C1 and the adjacent side of the conveyor C2, with its upper end somewhat below the plane of transfer of the assembly. The nozzle is suitably connected to the outlet of a blower 97, Fig. 11.

As appears from Fig. 11, each of the mechanisms G, BT and WM is provided with a one-cycle clutch which, when tripped, effects connection of the mechanism to a source of power to effect one cycle of operation and then effectively disconnects the mechanism from the source of power. In the system or machine shown, the wrapping mechanism WM, during its cycle, effects tripping of the one-cycle clutch of the wrapper feeding and coating mechanism G which, in turn, during its cycle, effects tripping of the box-registering mechanism BT.

It is to be understood that a single source of power may be used for all the mechanisms, though preferably, for convenience, as shown in Fig. 11, several motors or sources of power are used. The motor 98, for driving the wrapping mechanism WM through the main drive shaft 99, is connected thereto through the clutch 100, including the driven engaged member 101 biased to clutch position by spring means not shown.

To initiate operation of the system, the operator depresses pedal 102, Fig. 11, which swings the arm 103 in clockwise direction to pull the pin 104 from beneath the cam member 105 on shaft 106 which is driven from shaft 99 and makes one revolution for each cycle of the wrapping mechanism. Upon withdrawal of pin 104, the bell-crank lever 107 is free to swing in counter-clockwise direction, permitting the stop 108, rod 109, and the clutch operating member 110 to move to the right under the biasing actions of the clutch springs (not shown) and so effect driving connection between the motor 98 and the wrapper mechanism. During the resulting revolution of cam 105, the lever 111 having a follower engaging a groove 112 in the cam 105 is rocked. The link 113 is connected at its upper end to the lever 111 and at its lower end to an arm 114 loosely mounted on the shaft 115. The counter-clockwise rocking motion of the lever 111 is communicated to shaft 115 through the member 116 integral with the arm 114 and the slidable pin 117 carried by the arm 118 rigidly secured to shaft 115. To shaft 115 is secured the arm 119 connected by cable or rod 120 to the arm 121 on shaft 122 to which is also secured the arm 123 connected to the stop member 124 which controls the tripping of the one-time clutch of the gluing mechanism G.

The driving member 125 of the clutch is constantly rotated from a suitable source of power, for example, motor 126, through pulley 127, belt 128, pulley 129, shaft 130, pulley 131, belt 132, pulley 133, worm 134. The dog 135 pivotally mounted on member 136 secured to the one-time shaft 137 of the wrapper coating and feeding mechanism is held out of engagement with the teeth of the driving clutch member 125 until the stop 124 is withdrawn, whereupon spring means, not shown, swings the dog into engagement with the driven member. Before the driving member 125 completes one revolution, the latch member 124, under the control of cam 105 of the wrapping mechanism, is again returned to the position shown in Fig. 11 so that, at the end of one revolution of clutch member 125, the dog 135 engages the stop 124 and is thereby de-clutched from the driving member 125. The shaft 137 is connected by suitable means, not shown, to the wrapper feeding and coating mechanism, as understood in the art.

During the revolution of shaft 137, the cam 138 is effective to rock the lever 139 in counter-clockwise direction to effect engagement between the driven clutch member 140 slidably keyed to shaft 141 and the driving clutch member 142 freely rotatable with respect to shaft 141 and continuously driven through the gears 143, 144. Upon shaft 141 is mounted the driving roll 145 of the conveyor C1.

The angular relation between cam 138 and shaft 137 is adjustable to vary the time in the cycle of the wrapper feeding mechanism at which the conveyor begins to move in order that, for different sizes of wrappers, the conveyor movement will end when the wrapper is in a position of approximate register below the plunger 5 of mechanism BT. In the system shown, the length of the step of the conveyor C2 is the same for all sizes of wrappers.

The cam 146 which may be integral with cam 138 controls the tripping the one-time clutch of the blank registering mechanism BT. Specifically, when cam 146 rocks lever 147 in counter-clockwise direction, it effects, through cable 148, clockwise movement of the arm 149 freely rotatable on shaft 150 and engaged by the pin 151 extending from arm 152 slidably keyed to shaft 150. This movement of arm 149 effects clockwise movement of arm 153 secured to shaft 150 to lift the latch member 154 out of the notch in the member 155, permitting the driven clutch member 156 of the blank registering mechanism BT to move under the influence of biasing springs, not shown, into engagement with the driven clutch member 157. At the end of the cycle of the blank registering mechanism, cam 158 on a one-time shaft 159 of the mechanism BT restores the parts to the position shown in Fig. 11 to de-couple the mechanism BT from the driving motor 126.

During the cycle of the wrapping mechanism WM, its various sheet-applying tools, in manner well understood in the art, operate upon the blank and wrapper assembly to complete application of the wrapper and formation of a box. During part of the cycle, the conveyor C2 is operated through the same drive as the wrapping mechanism to bring the assembly in position between the operator and the path of the form block of the machine. Specifically, on the one-time shaft 106 of the wrapping mechanism is secured a gear 160 in mesh with gear 161 on shaft 162. The gear 163, secured to shaft 162, is in mesh with gear 164 mounted on but rotatable with respect to shaft 165. A clutch member 166, attached to or integral with gear 164, is normally in engagement with a driven clutch member 167 with which is rotatable another clutch member 168. The latter is slidably keyed to clutch member 167.

The cam 169 on shaft 162 controls movement of the lever 170 to move clutch member 171 to effect a driving connection between the disks of clutch 168 and clutch disks on shaft 165.

Accordingly, during the cycle of operation of the wrapping mechanism, cam 169 effects a driving connection between shaft 162 and shaft 165 through gears 163, 164, the clutch 166, 167 and the clutch 168.

Upon shaft 165, as appears most clearly in Fig. 11 is disposed one of the driving rolls 173 for the conveyor C2; a gear 174 on the end of shaft 165

is in mesh with gear 175 on shaft 176 to which is secured a cooperating driving roll 177.

After movement of the conveyor C2 for a predetermined time, and before completion of the cycle of operation of the wrapping mechanism, cam 169a, by its operation of member 171, interrupts the driving connection between shafts 162 and 165 by releasing clutch 168 and concurrently applies brake 172 to the conveyor shaft 165. The clutch and brake machanism 168, 172 may be of any known and suitable construction; that specifically illustrated is a "Pullmore" clutch manufactured by the Morse Chain Company.

If the operator holds the pedal 102 depressed, the cycle of the wrapping mechanism continuously repeats; but if this pedal is but momentarily depressed to initiate a cycle and then released, the pin 104, by biasing means not shown, moves into the path of the cam 105, and at the end of the wrapping mechanism cycle, is depressed thereby rocking the bell-crank lever 107 in clockwise direction to move the abutment 108 and its shaft 109 to the left, thereby effecting disengagement of the driven clutch member 101 from the driving clutch member 100.

The operation of the wrapping mechanism may be stopped at any time in its cycle by movement of the lever 178 in clockwise direction; the lower end 179 of the lever effects clockwise movement of the bell-crank lever 107 to effect disengagement of the driving clutch, as previously described.

The operator, by depressing the pedal 180, may prevent automatic tripping of the clutch of the wrapper feeding and coating mechanism G; the clockwise rotation of the bell-crank lever 181, which supports pedal 180, moves the latch member 117 out of engagement with arm 116 which is rocked during the cycle of the wrapper mechanism; consequently, rocking movement of the lever 111 is not communicated to shaft 115 and the wrapper coating and feeding mechanism does not operate so long as pedal 180 is held depressed. To the lever 181 is also connected the link 182 whose upper end is connected to arm 183 on rock-shaft 184 to which is also attached the arm 185. A rod 186 connects arm 185 to the yoke arm 187 which is received by a groove in the clutch member 167. Consequently, when the pedal 180 is depressed, the rod 186 effects counterclockwise movement of member 187 to effect disengagement between the clutch members 166 and 167. Therefore, so long as the pedal 180 is held depressed, the clutch members 166 and 167 are disengaged. Therefore, so long as the pedal 180 is held depressed, the conveyor C2 is not operated and feed of assemblies to the wrapping mechanism is discontinued.

The operator, by depressing the pedal 188 on shaft 115, can trip the one-time clutch of the feeding and coating mechanism independently of the wrapper-applying mechanism WM.

The proper timing relations between the various mechanisms depend upon the dimensions of the wrappers and boxes; the adjustment of cam 104a with respect to shaft 106 depends upon the depth of the box to be wrapped; this cam controls reciprocation of corner-lap tools, as appears in aforesaid Rider et al. Patent No. 2,058,036.

Since this same cam is utilized to control tripping of the wrapper feeding and coating mechanism, the time in the cycle of the wrapping mechanism at which the wrapper feeding and coating mechanism G begins its operation, depends upon the depth of the box to be wrapped. Furthermore, as described above, for different widths of wrapper, the cam 138 is adjusted with respect to shaft 137 in order that when the conveyor C1 stops, a wrapper will be in position of approximate register below the plunger 5 of mechanism BT.

The time in the cycle of the wrapper feeding and coating mechanism G, at which the cycle of the box-registering mechanism BT is initiated, is variable by change in setting of cam 146.

Although the wrapping mechanism WM, the wrapper feeding and coating mechanism G and the box-registering mechanism BT begin their cycles in the order named, for continuous operation of the entire machine, initiation of successive cycles of the wrapping mechanism WM does not depend upon, or await the completion of, the cycle of either of the other two mechanisms. The timing relation between the three mechanisms which provides for the same high output of boxes, regardless of the size of the box for the capacity of machine, can best be understood by reference to Fig. 14.

As appears from the upper part of the figure, the conveyor C2 is moving while the form block is not in position to receive a box; specifically, the conveyor C2 is moving to transport boxes toward the wrapping mechanism while the form block is moving downward and at rest at or near the lower end of its stroke for operation of the wrapper-applying tools; the conveyor C2 comes to rest before the form block again returns to an accessible position to permit an operator to remove an assembly from the conveyor in anticipation of arrival of the form block in the region where it is accessible. The operator, therefore, has the assembly in hand and ready to place on the form as soon as it comes to rest or is above and clear of the wrapper-applying tools. The timing relation between the conveyor C2 and the form block is the same for all sizes of wrappers.

For a deep, wide box, the one-time clutch of the wrapper feeding and coating mechanism G is tripped rather early in the cycle of the wrapper-applying mechanism WM; for example, as shown in the figure, it may be tripped at approximately 80° of the wrapping machine cycle. The cam 138 of mechanism G which controls the clutch 140, 142 of conveyor C1 is so adjusted the wrapper conveyor C1 is in motion for a substantial portion of the time for which the assembly conveyor C2 is at rest; specifically, the movement of the conveyor C1 begins at about 205° of the wrapping machine cycle. For the wide, deep box, the one-time clutch of the wrapper-registering mechanism BT is tripped late in the cycle of the wrapper mechanism WM; specifically, at about 250°, and the registration of a box by the plunger 5 begins early in the cycle of the wrapping mechanism WM, specifically, at about 10°.

For a narrow, shallow box, as appears from the lower part of Fig. 14, the timing relations are quite different; specifically, tripping of the one-time clutch of the wrapper feeding and coating mechanism G occurs later in the cycle, specifically, at about 105° but the conveyor C1 begins its movement earlier in the cycle than before, specifically, at about 160° of the cycle of the wrapping mechanism WM. Furthermore, the box-registering mechanism BT is tripped earlier in the cycle of the wrapping mechanism WM than before, specifically, at about 200°, and the box-registering movement of the plunger 5 begins late in the

cycle of the wrapping mechanism, specifically, at about 305° instead of at about 10°, which was the case for a deep, wide box.

In the system of the type shown, it is necessary that the conveyor C1 be at rest for operation of the box-registering mechanism BT and its associated panel-flattening mechanism F, and that the conveyor C2 be at rest during transfer of an assembly thereto. The arrangement shown for timing the movement of the several mechanisms permits these relations to be preserved for a wide range in sizes of the boxes and without need for the wrapping mechanism WM to pause at the end of its cycle until either or both of the other mechanisms have completed their individual cycle or cycles.

While I have illustrated and specifically described a preferred arrangement of the invention, it is to be understood my invention is not limited thereto, but is coextensive in scope with the appended claims.

What I claim is:

1. In a system comprising sheet-applying mechanism, a conveyor for transporting assemblies comprising box-structure and partially applied sheet material toward said sheet-applying mechanism, means for effecting intermittent operation of said conveyor in timed relation to said sheet-applying mechanism, an intermittently operated second conveyor for transporting said assemblies from an assembly station and during each movement delivering one of said assemblies directly onto said first conveyor, and means effecting operation of said second conveyor when said first conveyor is at rest.

2. In a system comprising sheet-applying mechanism, an endless conveyor for transporting assemblies comprising box-structure and partially applied sheet material toward said sheet-applying mechanism, mechanism operating at an assembly station in timed relation to said sheet-applying mechanism to effect engagement of box-structures with wrappers to form assemblies, a second endless conveyor for transporting said assemblies from said assembly station onto said first conveyor, and means effecting operation of said second conveyor when said first conveyor is at rest.

3. In a system comprising box-wrapping mechanism, a conveyor for transporting individual wrappers toward said wrapping mechanism, a conveyor, whose delivery end is spaced from said first-named conveyor, for transferring wrappers directly onto the upper surface of said first conveyor during motion of the second-named conveyor toward said first-named conveyor, and means providing a directed current of air to prevent drooping of the leading edges of the wrappers during their transfer.

4. In a system comprising box-wrapping mechanism, a conveyor for transporting assemblies comprising box structure and partially applied sheet material freshly coated with adhesive toward said wrapping mechanism, a conveyor, whose delivery end is spaced from said first-named conveyor, for transporting said assemblies from an assembly station and directly onto the upper surface of said first conveyor, and means providing a directed current of air in the gap between said conveyors to prevent the leading edges of unapplied sheet material from drooping as the assemblies pass from one conveyor to the other.

5. A system comprising an endless conveyor for transporting individual wrappers freshly coated with adhesive toward a wrapper-applying station, a second endless conveyor directed toward and having its delivery end closely adjacent said first conveyor to deliver said wrappers directly onto said first conveyor, and means providing an upwardly directed current of air in the gap between said conveyors.

6. A system comprising a conveyor for transporting wrappers toward a wrapper-applying station, a second conveyor extending substantially at right angles thereto for delivering wrappers thereon, and mechanism for intermittently actuating said conveyors to effect a period of rest of one of them during at least a part of the period of movement of the other.

7. A system comprising an endless conveyor for transporting wrappers whose upper faces are coated with unset adhesive toward a wrapping station, a second endless conveyor having its delivery end closely adjacent a side of said first conveyor to deliver said wrappers directly onto said first conveyor, mechanism for effecting alternate operation of said conveyors, and means providing an air blast in the gap between said conveyors to prevent engagement of the coated faces of said wrappers with said second conveyor.

8. In a system comprising sheet-applying mechanism, conveyor structure for transporting wrappers or tabs, means operating in timed relation to said mechanism for effecting registered adhesive engagement of box-structures with wrappers or tabs on said conveyor structure to form assemblies, and means between said sheet-applying mechanism and said registering means for rotating the assemblies to substantial extent for further transport by said conveyor structure in angularly displaced position with respect thereto.

9. In a system comprising sheet-applying mechanism, endless conveyor structure for transporting wrappers or tabs adjacent thereto, means operating in timed relation to said mechanism for effecting registered adhesive engagement of box-structures with wrappers or tabs on said conveyor structure to form assemblies, and mechanism reciprocable toward and from said conveyor structure and rotatable about its axis of reciprocation for rotating said assemblies in succession to an angularly displaced position with respect to said conveyor surface.

10. In a system comprising a conveyor for transporting assemblies comprising box-structure and partially applied sheet material, and means for moving said assemblies, subsequent to their delivery to and transport by said conveyor, angularly with respect to said conveyor for further movement therewith in the angularly displaced relation.

11. In a system comprising a wrapping machine, a conveyor for transporting box-structure and wrapper assemblies toward said machine, and oscillatory mechanism for turning said assemblies angularly with respect to said conveyor properly to present the assemblies to said wrapping machine.

12. In a system comprising sheet-applying mechanism, an endless conveyor for transporting assemblies comprising box-structure and partially applied sheet material toward said sheet-applying mechanism, a second endless conveyor for delivering said assemblies onto said first conveyor, and mechanism for registering box-structures on sheet material disposed on said second conveyor to form said assemblies.

13. In a system comprising box-wrapping mechanism, an endless conveyor for transporting box-structure and wrapper assemblies toward said wrapping mechanism, a second endless conveyor for delivering said assemblies onto said first conveyor, mechanism for registering box-structures on wrappers disposed on said second conveyor to form said assemblies, and means for rotating said assemblies on said second conveyor prior to delivery thereby onto said first conveyor.

14. A system comprising a conveyor movable step-by-step to transport box-structure and wrapper assemblies, and means operable while said conveyor is at rest for rotating an assembly for subsequent transport by said conveyor in angularly displaced position with respect thereto.

15. A system comprising a conveyor for transporting a wrapper to a position of approximate predetermined alignment, registering means comprising a movable member adapted at said position to separate an edge of the wrapper from the surface of said conveyor, and means for pneumatically holding the wrapper to said member during its movement thereby from said position to the position of exact alignment.

16. A system comprising a conveyor for transporting a wrapper to a position of approximate alignment, stop structure defining the position of exact alignment of said wrapper, and registering means comprising a member for moving an edge of said wrapper from the surface of said conveyor to engage said stop structure during movement of the wrapper by said registering means.

17. A system comprising a conveyor for transporting a wrapper to a position of approximate predetermined alignment, registering means comprising a movable member adapted to lift an edge of a wrapper from said conveyor, and stop structure, defining the position of exact alignment of the wrapper, engaged by the lifted edge of said wrapper during its movement by said registering means.

18. A system comprising a conveyor for transporting a wrapper to a position of approximate predetermined alignment, registering means comprising a movable member adapted at said position to separate an edge of the wrapper from the surface of said conveyor, and means for applying suction through said member to said edge of the wrapper during its movement from said position to a position of exact alignment.

19. A system comprising a conveyor for transporting a wrapper to a position of approximate predetermined alignment, registering means comprising a movable member adapted at said position to separate an edge of the wrapper from the surface of said conveyor, and means for applying an air blast to hold the wrapper against said member during its movement from said position to the position of exact alignment.

20. A system comprising a conveyor for transporting a wrapper to a position of approximate alignment, registering means comprising a movable member adapted to lift an edge of a wrapper from said conveyor, stop structure defining the position of exact alignment of the wrapper engaged by the lifted edge of said wrapper during its movement by said registering means, and means for applying suction through said conveyor to said wrapper during its registering movement.

21. A system comprising a conveyor for transporting a wrapper to a position of approximate predetermined alignment, means for applying suction through said conveyor to said wrappers, registering means comprising a movable member adapted at said position to lift an edge of a wrapper, stop structure engaged by the lifted edge of the wrapper during its movement by said registering means, and means for reducing the suction during registering movement of said wrapper.

22. In a box machine comprising sheet-applying mechanism, a conveyor movable toward said sheet-applying mechanism, motive means, means normally operative during a portion of each cycle of said machine to effect operation of said conveyor by said motive means in timed relation to said sheet-applying mechanism, and means operable at will to prevent operation of said conveyor by said motive means during any cycle or number of cycles of said machine.

23. In a box machine comprising sheet-applying mechanism, a conveyor movable toward said sheet-applying mechanism, motive means for said sheet-applying mechanism, means including clutch members in engagement during a portion of each cycle of said machine to effect operation of said conveyor by said motive means in timed relation to said sheet-applying mechanism, and means operable at will to prevent transmission of motion from said motive means to said conveyor through the engaged clutch members.

24. In a box machine comprising sheet-applying mechanism, a conveyor movable toward said sheet-applying mechanism, motive means for driving said conveyor, clutch members engaged and disengaged in each cycle of said sheet-applying mechanism and normally effective to couple and decouple said motive means and said conveyor, and clutch means operable at will to prevent operation of said conveyor by said motive means notwithstanding engagement of said clutch members.

25. In a box machine comprising sheet-applying mechanism, a conveyor movable toward said sheet-applying mechanism, motive means, a one-cycle clutch for coupling said sheet-applying mechanism to said motive means, a clutch for coupling said motive means to said conveyor, and means operating in timed relation to said sheet-applying mechanism for controlling both the release and engagement of said second clutch within each cycle of said first-named clutch.

26. In a box machine comprising sheet-applying mechanism, a conveyor movable toward said sheet-applying mechanism, motive means, a one-cycle clutch for coupling said sheet-applying mechanism to said motive means, a conveyor for transporting box-elements toward said sheet-applying mechanism, a clutch for coupling said motive means to said second-named conveyor, means operating in timed relation to said sheet-applying mechanism for controlling the release and engagement of said second clutch, and a third clutch operable at will to prevent operation of said second-named conveyor by said motive means.

27. In a box system comprising mechanism for feeding wrappers and coating them with adhesive, a conveyor for transporting coated wrappers from said feeding-and-coating mechanism, and cyclically operated sheet-applying mechanism, a conveyor for receiving wrappers from said first conveyor and transporting them toward said sheet-applying box mechanism, means for beginning and terminating movement of said second conveyor within each cycle of said sheet-applying mechanism, means for beginning and

terminating movement of said first conveyor within each cycle of said feeding-and-coating mechanism, and means operated during the cycle of said wrapping mechanism to initiate the cycle of said feeding-and-coating mechanism.

28. In a box system comprising cyclically operated mechanism for feeding wrappers and coating them with adhesive, a conveyor for transporting coated wrappers from said feeding-and-coating mechanism, and cyclically operated box-wrapping mechanism, a conveyor for receiving wrappers from said first conveyor and transporting them toward said box-wrapping mechanism, means for effecting operation of said second conveyor in timed relation to said box-wrapping mechanism, means for effecting operation of said first conveyor in timed relation to said feeding-and-coating mechanism, means operated during the cycle of said wrapping mechanism to initiate the cycle of said feeding-and-coating mechanism, and means operable at will to disable said last-named means and to prevent operation of said second-named conveyor.

29. In a box-wrapping system comprising cyclically operated mechanism for feeding wrappers and coating them with adhesive, a conveyor for transporting coated wrappers from said feeding-and-coating mechanism, and cyclically operated box-wrapping mechanism, a conveyor for receiving wrappers from said first conveyor and transporting them toward said box-wrapping mechanism, means for effecting operation of said second conveyor in timed relation to said box-wrapping mechanism, means for effecting operation of said first conveyor in timed relation to said feeding-and-coating mechanism, means operated during the cycle of said wrapping mechanism to initiate the cycle of said feeding-and-coating mechanism, and means operable at will to initiate the cycle of said feeding-and-coating mechanism independently of said last-named means.

30. In a box-wrapping system comprising cyclically operating box-wrapping mechanism, a conveyor operable during the cycle of said mechanism to transport box-structure and wrapper assemblies toward said mechanism, mechanism for feeding and coating wrappers whose cycle is initiated by said wrapping mechanism, a conveyor operable during the cycle of said feeding and coating mechanism for transporting wrappers to said first conveyor, cyclically operating mechanism operable during the cycle of said feeding-and-coating mechanism to register a box structure on a wrapper on said second-named conveyor, and means to provide the same production rate of said system throughout a wide range in size of boxes comprising means for shifting, in the cycle of said box-wrapping mechanism, the initiation of the cycles of said feeding-and-coating mechanism and of said registering mechanism, and the timing of said second-named conveyor.

31. In a box-wrapping system comprising cyclically operating form-block structure, a conveyor for transporting box-structure and wrapper assemblies adjacent to the path of said form-block structure, means effecting movement of said conveyor during part of the cycle of said form-block structure when it is inaccessible to receive an assembly and for providing that said conveyor is at rest before or when said form-block is accessible to receive an assembly, a second conveyor for delivering said assemblies onto said first conveyor, and means effecting operation of said second conveyor when said first conveyor is at rest.

32. In a system comprising a cyclically operated box machine, a conveyor for transporting wrappers or tabs toward said box machine, means for beginning and terminating operation of said conveyor at fixed points in the cycle of said machine, mechanism for feeding and adhesively coating wrappers or tabs, a one-cycle clutch for said feeding-and-coating mechanism, means operated by said box machine for tripping said clutch at a point in the cycle of said box machine variable for different sizes of boxes, a conveyor for transporting wrappers or tabs from said mechanism and delivering them onto said first conveyor while at rest, and means for beginning and terminating operation of said second conveyor at points in the cycle of said mechanism different for different sizes of boxes.

33. In a system comprising a cyclically operated box machine, a conveyor for transporting assemblies each comprising box structure and a partially applied wrapper or tabs toward said box machine, means for beginning and terminating operation of said conveyor at fixed points in the cycle of said machine, mechanism for feeding and adhesively coating wrappers or tabs, a one-cycle clutch for said mechanism, means operated by said box machine for tripping said clutch at a point in the cycle of said machine variable for different sizes of boxes, a conveyor for transporting wrappers or tabs from said mechanism and onto said first conveyor, means for beginning and terminating operation of said second conveyor at points in the cycle of said mechanism different for different sizes of boxes, mechanism for registering box structures on wrappers or tabs on said second conveyor, a one-cycle clutch for said registering mechanism, and means operated by said coating-and-feeding mechanism for tripping said second one-cycle clutch at a point in the cycle of said coating-and-feeding mechanism different for different sizes of boxes.

34. In a box machine comprising sheet-applying mechanism, a conveyor movable toward said sheet-applying mechanism, a source of power, two clutches effectively in series between said source of power and said conveyor, means for effecting engagement and disengagement of the members of one of said clutches within each cycle of said machine normally to effect movement of said conveyor in each cycle, and means operable at will to effect disengagement of the members of the other of said clutches to prevent said movement of the conveyor within any cycle or number of cycles of said machine.

35. In a box machine comprising sheet-applying mechanism, a conveyor movable toward said sheet-applying mechanism, a power shaft, a clutch member continuously connected to said power shaft, a clutch member continuously connected to said conveyor, two clutch members rotatable as a unit and axially movable for engagement with said first and second-named clutch members respectively, mechanism operating in timed relation to said sheet-applying mechanism for effecting movement of one of said last-named clutch members into and out of engagement with one of said continuously connected clutch members, and means operable at will to effect disengagement or engagement of the other of said last-named clutch members with the other of said continuously connected clutch members.

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