March 17, 1931. J. S. STOKES 1,796,731

METHOD OF AND APPARATUS FOR FORMING BOXES AND THE LIKE

Filed Nov. 10, 1926 6 Sheets-Sheet 1

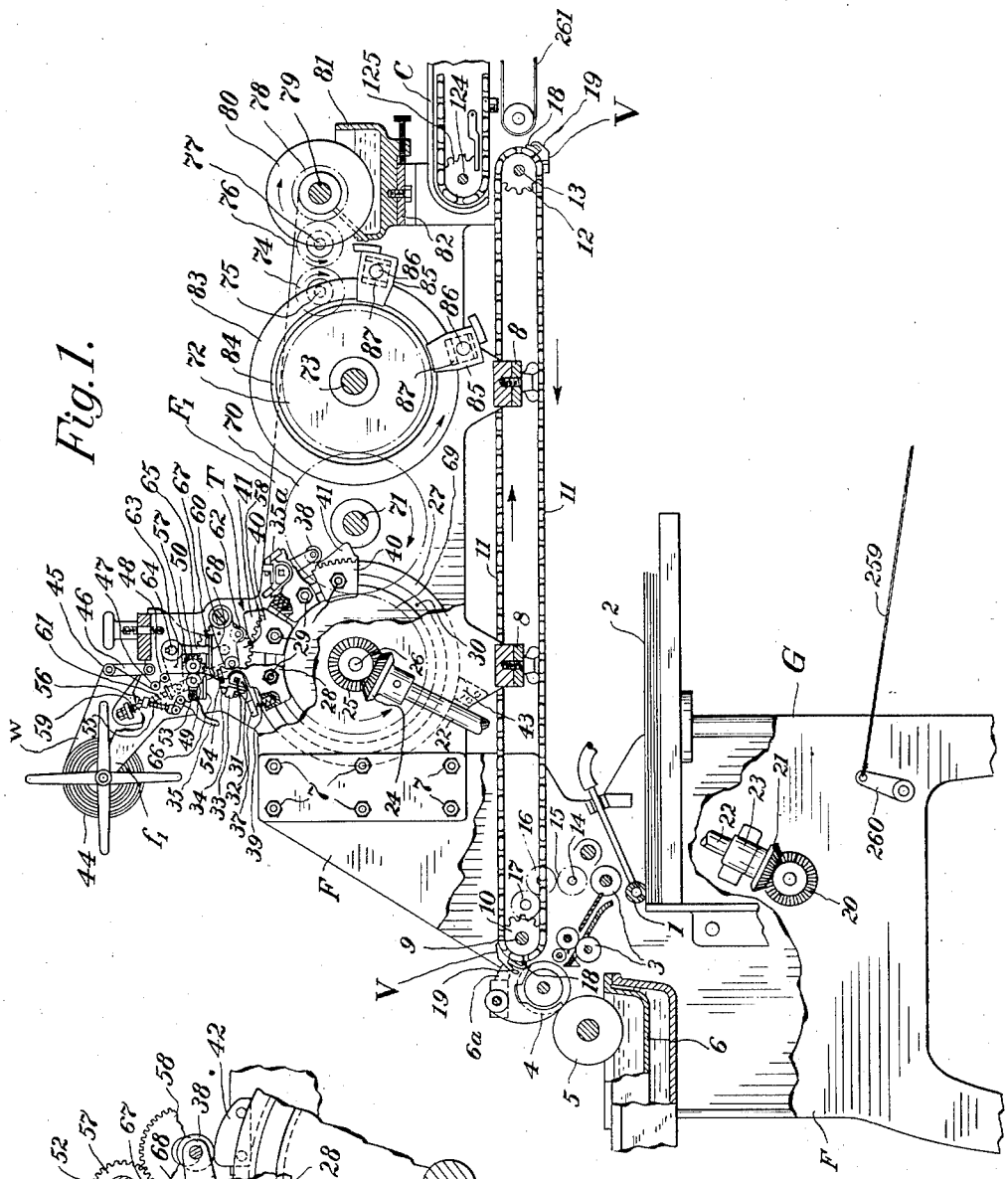


Fig. 1.

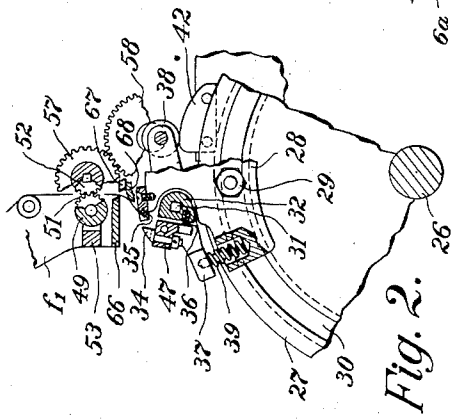


Fig. 2.

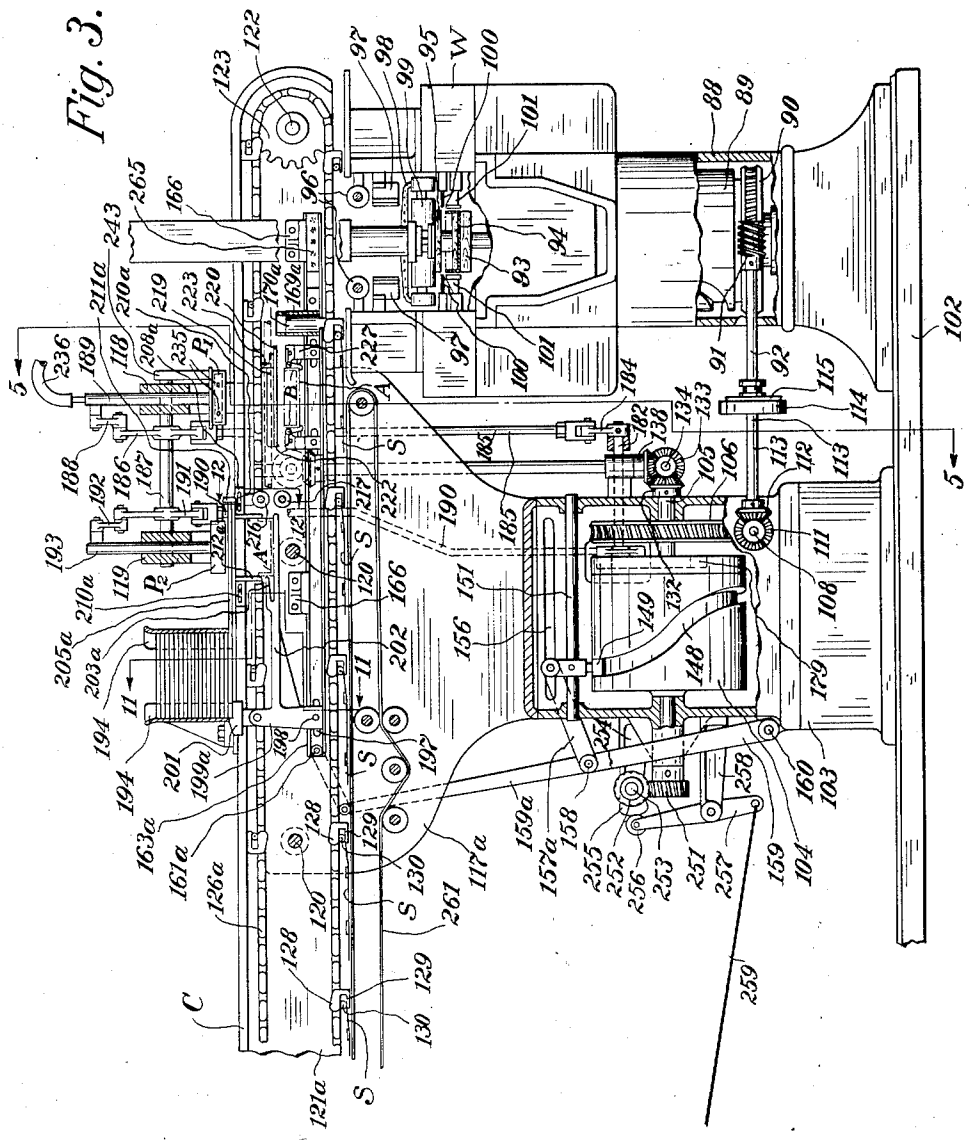
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METHOD OF AND APPARATUS FOR FORMING BOXES AND THE LIKE

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Fig. 3.



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METHOD OF AND APPARATUS FOR FORMING BOXES AND THE LIKE

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Fig. 4.

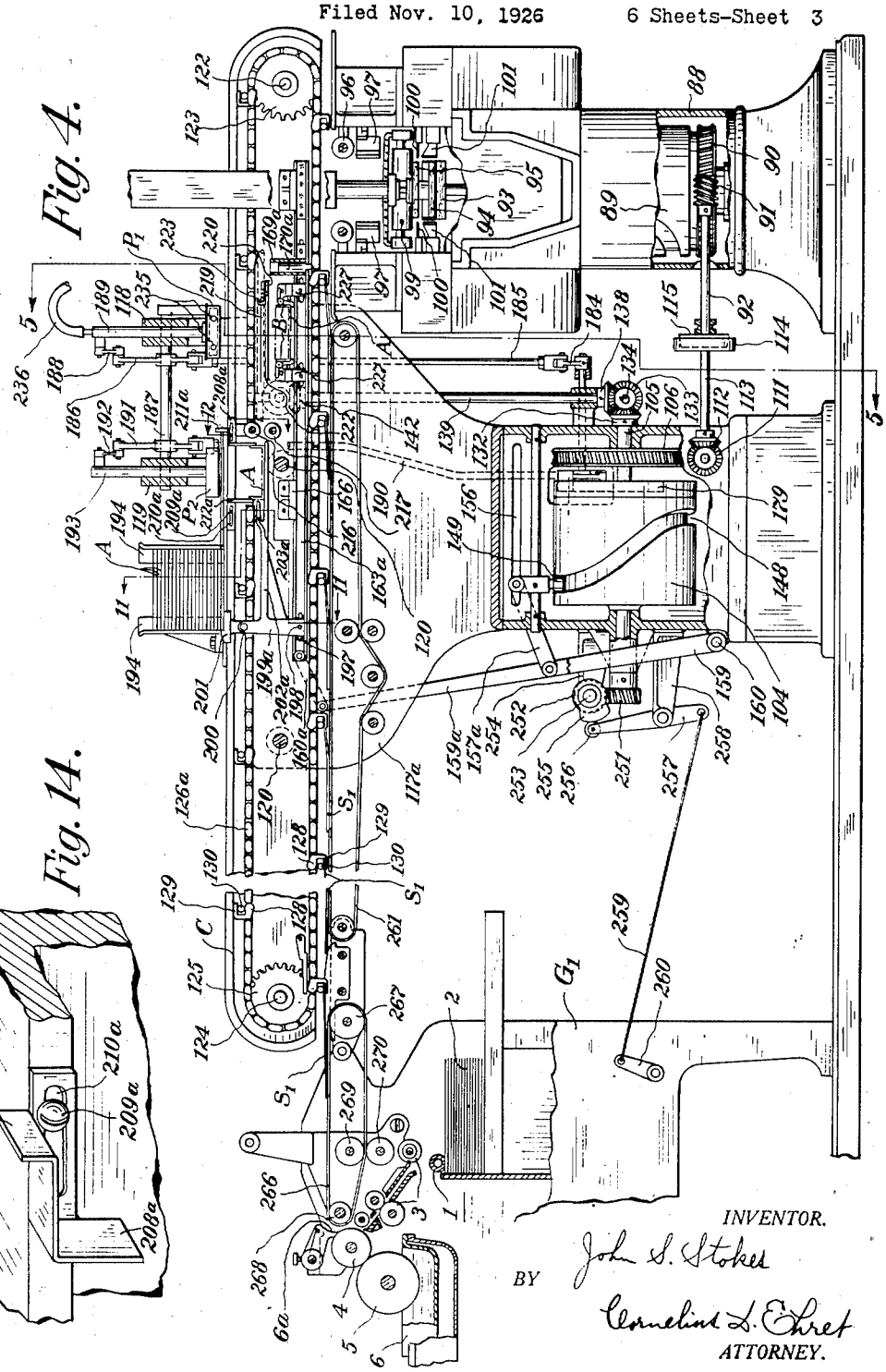


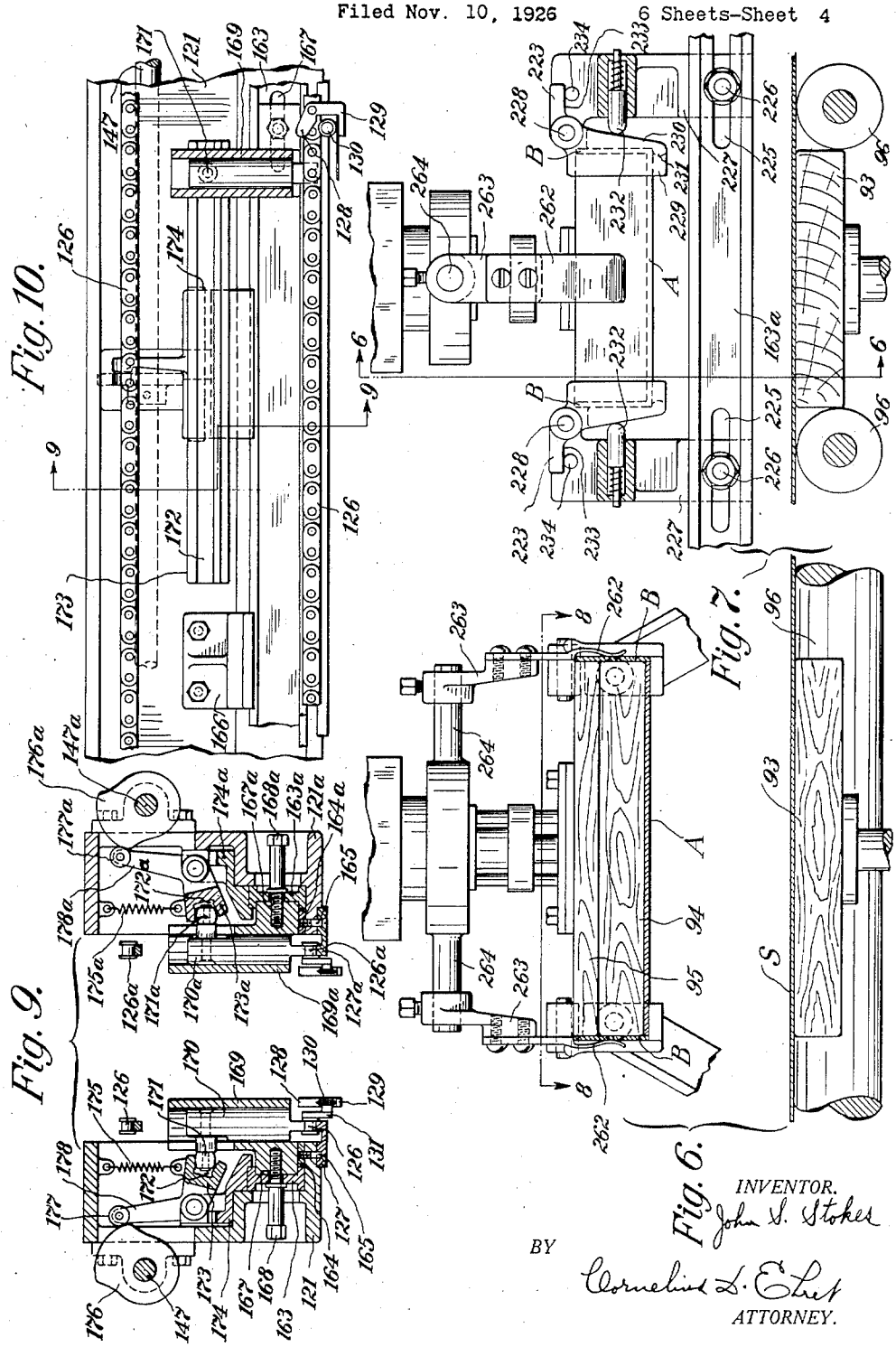
Fig. 14.

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METHOD OF AND APPARATUS FOR FORMING BOXES AND THE LIKE

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METHOD OF AND APPARATUS FOR FORMING BOXES AND THE LIKE

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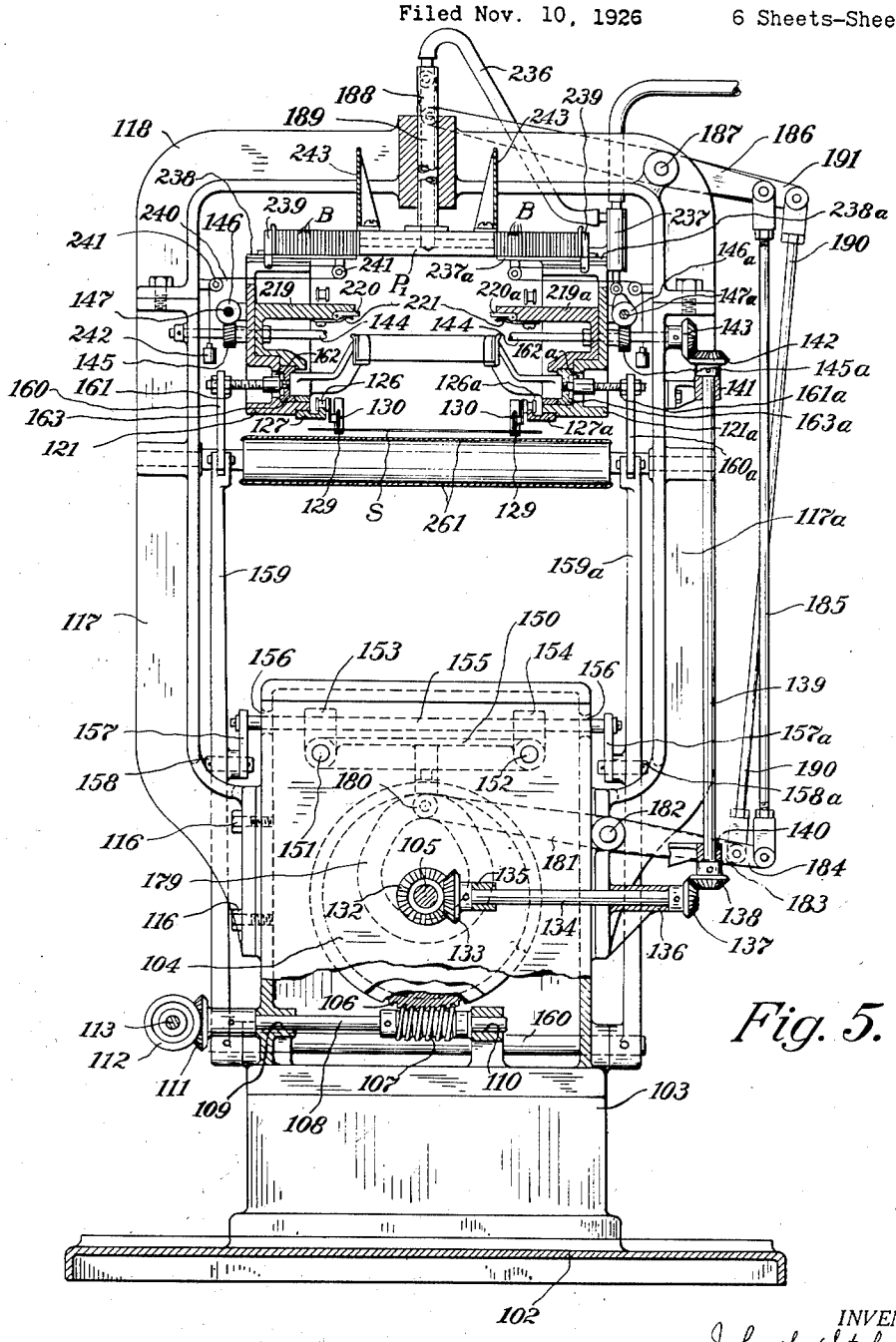


Fig. 5.

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METHOD OF AND APPARATUS FOR FORMING BOXES AND THE LIKE

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Fig. 8.

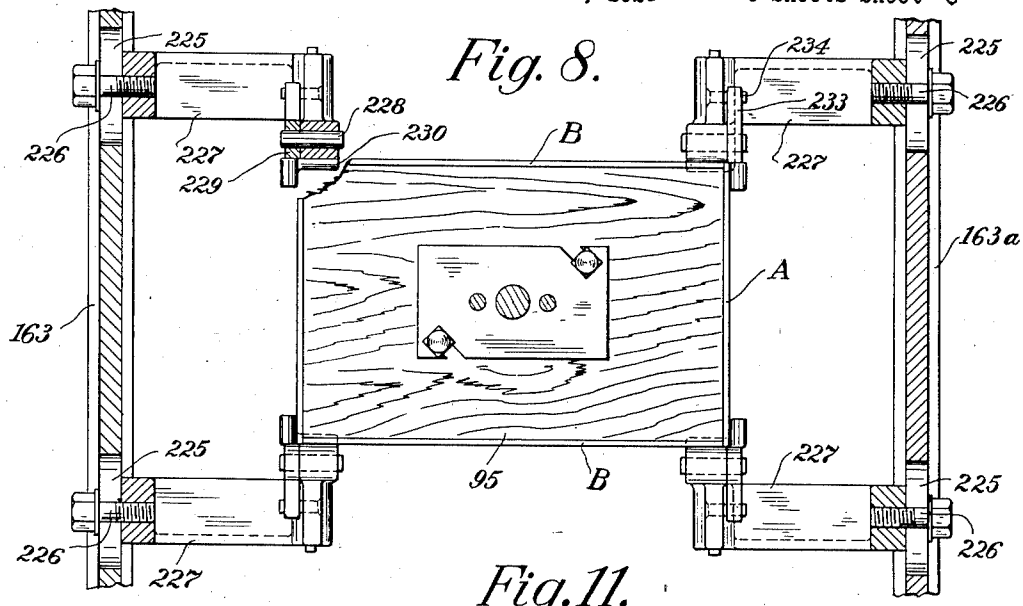


Fig. 11.

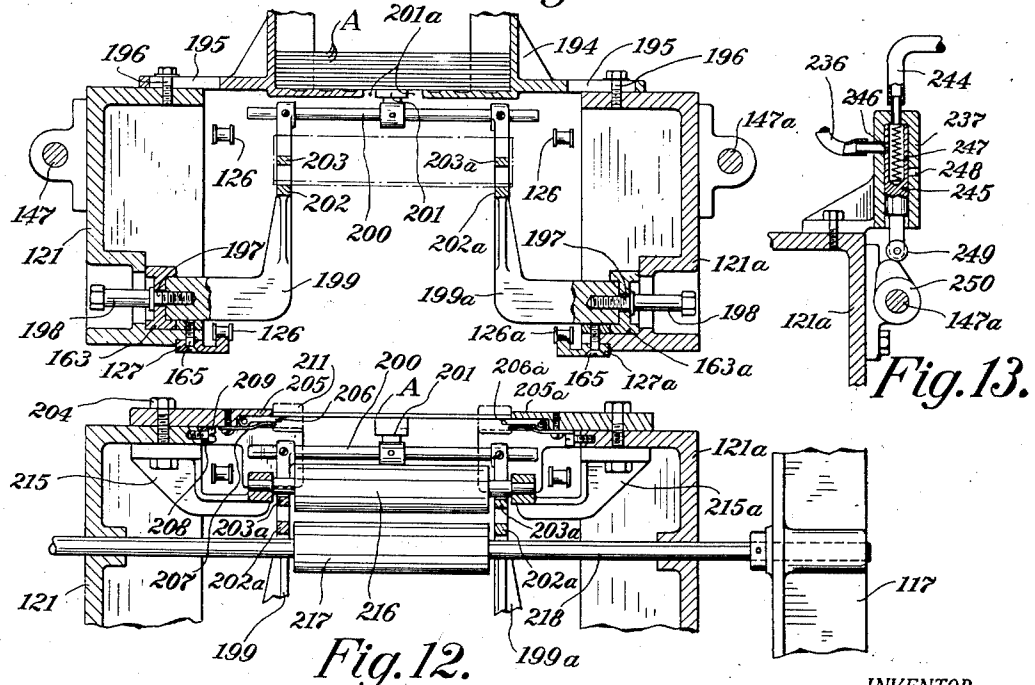


Fig. 12.

Fig. 13.

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Patented Mar. 17, 1931

1,796,731

UNITED STATES PATENT OFFICE

JOHN S. STOKES, OF HUNTINGDON VALLEY, PENNSYLVANIA, ASSIGNOR TO STOKES AND SMITH COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

METHOD OF AND APPARATUS FOR FORMING BOXES AND THE LIKE

Application filed November 10, 1926. Serial No. 147,405.

My invention relates to the art of applying wrappers, sheets, labels, or equivalent, particularly those that are tabbed or reinforced to any suitable number of individual components, sections or elements of suitable material destined to form a box, box top, carton, container structure, or equivalent.

In accordance with one phase of my invention, a box or the like is formed or constructed by assembling a plurality of separate box-forming components in box-forming position and to the assembled structure there is then applied a wrapper or the like, consisting of a single piece or composed of several elements, having thereon an adhesive coating, preferably fluid in character.

My invention relates to a method and apparatus for constructing a box, carton, or the like, as aforesaid, and also relates to apparatus for performing substantially the method disclosed in my copending application, Serial No. 88,231, filed February 15, 1926.

It is characteristic of my invention that to one face or surface of individual wrappers in succession is applied an adhesive coating and, before material drying or setting of the adhesive, the coated side of an individual wrapper is applied to a plurality of separate box-forming components to hold them in box-forming position, and, more particularly, there are applied to the wrapper, either in its coated or uncoated state, a plurality of reinforcing elements or tabs to whose exposed surfaces there is then applied adhesive, and, preferably, before material drying or setting of the adhesive coatings on either the wrapper or tabs, the tabbed wrapper is applied to the box-forming components.

My invention comprehends an organization or system of units or mechanisms operating in timed relation for delivery in succession into the path of the form-block structure of a wrapping machine groups of box-forming components and adhesively coated wrappers, preferably tabbed.

More particularly in accordance with my invention, the aforesaid organization or system includes mechanism for shaping and assembling the various box-forming components, and other mechanisms for adhesively coating the wrappers, applying tabs thereto, adhesively coating the exposed faces of the tabs, and for conveying the tabbed wrappers and the groups of box-forming components into the path of the wrapping machine form-block structure.

My invention resides in the method and apparatus of the character hereinafter described and claimed.

For an understanding of my method and for an illustration of some of the various forms my apparatus may take, reference is to be had to the accompanying drawing, in which:

Fig. 1 is a side elevational view, partly in section, of one form of apparatus for applying tabs to wrappers.

Fig. 2 is a fragmentary view on an elongated scale of part of the structure shown in Fig. 1.

Fig. 3 is a side elevational view with part of the housing structure broken away showing the wrapping machine and the delivery end of the conveying mechanisms.

Fig. 4 is a side elevational view, with parts broken away, illustrating a box-wrapping system utilizing either plain wrappers or wrappers previously tabbed.

Fig. 5 is a transverse view partly in section, taken on the line 5—5 of either Figs. 3 or 4.

Fig. 6 is an elevational view, partly in section and with parts omitted, taken on the line 6—6 of Fig. 7.

Fig. 7 is a side elevational view of the structure shown in Fig. 6.

Fig. 8 is a horizontal sectional view with parts in plan, taken on the line 8—8 of Fig. 6.

Fig. 9 is a horizontal sectional view with parts in elevation, taken on the line 9—9 of Fig. 10.

Fig. 10 is a side elevational view looking toward the left of the structure shown at the left of Fig. 9.

Fig. 11 is a vertical sectional view in horizontal position, taken on the line 11—11 of Fig. 3 or 4.

Fig. 12 is a transverse sectional view with parts in elevation, taken on the line 12—12 of Fig. 3 or 4.

Fig. 13 is a fragmentary sectional view with parts in elevation, showing a valve structure.

Fig. 14 is a perspective view on an enlarged scale showing an adjustable form plate.

Referring to Fig. 1, there is illustrated an adhesive-applying unit G, mechanism generically indicated at T for severing tabs, applying the severed tabs to a coated wrapper, and applying adhesive to the exposed tabbed surfaces, and the receiving end of conveying mechanism C for transporting the coated tabbed wrapper toward the wrapping mechanism W, Fig. 3.

The adhesive-applying unit G may be of any suitable type capable of applying adhesive to wrappers of box-wrapping paper, or other suitable material, and delivering the coated wrappers in succession preferably at uniform intervals. For example, the unit G may be of the same general type disclosed in Nitsch and Federwitz Letters Patent No. 1,472,614, granted October 30, 1923, or in Federwitz and Bailey application, Serial No. 40,769, filed July 1, 1925, or in the Nitsch and Weightman application, Serial No. 69,249, filed November 16, 1925.

The tabbing unit or mechanism T may be of the general character as disclosed, for example, in United States Letters Patent to Reifsnyder and Schwerdtle, No. 1,060,026, granted April 29, 1913, or to Nitsch, Weightman and Streeper, No. 1,451,782, granted April 17, 1923.

The conveying unit C may be of the same general character disclosed in the aforesaid Federwitz and Bailey application, Serial No. 40,769, or in the Federwitz and Bailey application, Serial No. 70,462, filed November 21, 1925.

The wrapping machine W may be of any suitable character, for example, as illustrated in the prior Letters Patent to Smith, No. 691,329, Nitsch & Federwitz, No. 1,540,900, or Federwitz and Bailey, Nos. 1,541,036 and 1,541,255.

The wrappers, labels or the like herein contemplated may be tabbed or not, and each may consist of a single piece of material or may be composite in character as disclosed in Letters Patent No. 1,265,273 or in my prior application, Serial No. 89,127, filed February 18, 1926.

In the example illustrated, the adhesive-applying unit G is of the same general type disclosed in the aforesaid Nitsch and Federwitz Letters Patent No. 1,472,614. Unit G is driven at suitable speed by any suitable source of power and at predetermined intervals the suction roller 1 functions to deliver single wrappers S in succession from the stack 2 of unglued wrappers through the rotary feed roll mechanism designated generally at 3 into engagement with the glue-distributing roll 4 which engages the glue drum 5 so mounted as to rotate with its lower surface immersed in adhesive contained in the receptacle 6. As well understood in the art, the glue-distributing roll 4 by engaging the glue drum 5 has applied to its surface an adhesive coating which in turn is applied to individual wrappers as they are fed into engagement therewith through the rotary feed roll mechanism 3. The glue-distributing roll 4 rotates in a counterclockwise direction and carries the advanced edge of a wrapper into engagement with the stripper members 6a which function to deflect the wrapper toward wrapper-gripping and conveying mechanism for the tabbing apparatus.

As herein illustrated, the tabbing apparatus, the tab-coating apparatus and the wrapper-conveying mechanism therefor are of the character illustrated in my prior application Serial No. 97,198, filed March 25, 1926. In accordance with the disclosure of that application, the side frames F of the adhesive-applying unit G are extended upwardly above the coating mechanism comprised in said unit and are secured in suitable manner, as by the bolts 7, to the side frames F1 of the tabbing apparatus or mechanism, the latter comprising the transverse supporting or tying members 8.

Disposed within the frames F, but not shown herein, are the usual auxiliary pivotally mounted frames of the adhesive-applying unit G. Journaled in said pivotally mounted frames is a shaft 9 carrying adjacent one end thereof a sprocket 10 or the like which drives the chain, band or equivalent 11 passing over the idler sprocket 12 mounted on a shaft 13 journaled in bearings in the frames F1 adjacent the receiving end of the conveying unit C. It shall be understood that shaft 9 adjacent its other end carries a sprocket similar to the sprocket 10 driving a member equivalent to the chain or band 11, which member passes over another idler sprocket on the shaft 13.

Referring to Fig. 1, the shaft 14, mounted in bearings in the frame members F of the adhesive-applying unit, is the usual member controlling intermittent step-by-step movement of the usual wrapper-conveying belt structure of such unit. Shaft 14, as well understood in the art, is rotated only during each cycle of operation of the adhesive-applying unit, and has heretofore been utilized to advance the belt structure of the unit just after a wrapper has left the glue-distributing roll and been deposited on said belt structure. Shaft 14 carries a gear 15 meshing with an idler gear 16, in turn meshing with an idler gear 17, which meshes with

and drives a gear 18 keyed to the shaft 9. Accordingly, for each cycle of operation of the adhesive-applying unit G, the upper and lower spans of chain 11 and the corresponding chain, not shown, are advanced in the direction of the respective arrows, Fig. 1.

The aforesaid chains each carries a pair of suitable wrapper grippers V disposed in transverse alignment, each gripper comprising a base member 18 carried by a link pin of the chain, a gripper palm 19 pivoted on the next adjacent link pin, and an actuating arm, not shown. With a gripper secured in position on one chain, the other gripper is so located on the same chain that the distance between them will be the same no matter in which direction measurement is effected from the gripper first fixed in position.

Between the aforesaid chains and suitably fixed in position are members or abutments, not shown, for moving the actuating arms of each gripper V to open the same. As disclosed in my aforesaid application, Serial No, 97,198, one pair of such members or abutments is suitably secured to the transverse members of the usual auxiliary pivotally mounted frames, not shown, of the adhesive-applying unit G, but which, as stated above, are disposed within the frames F. Each of another pair of such members or abutments is located in the path of the actuating arm of each gripper V adjacent the receiving end of the conveyer unit C.

In Fig. 1, the grippers V on chain 11 are illustrated in the position assumed thereby while the chain is at rest. The gripper V adjacent the glue-distributing roll 4 and the one in transverse alignment therewith have been moved by their respective chains into such position that the aforesaid abutments or members by engagement with their actuating arms have functioned to move the gripper palms 19 from their respective base members 18. In such position, the two grippers remain at rest, while the feed roll mechanism 3 advances the forward edge of a wrapper thereinto. The timing is such that upon arrival of the forward edge of the wrapper within the aforesaid grippers, the shaft 14 is actuated through the train of gears described above, and the upper spans of the chains are moved toward the right, Fig. 1. But slight movement is necessary to free the actuating arms of the grippers from the members or abutments controlling movement of the same, whereupon palms 19 move into gripping engagement with the top surface of the wrapper, whose bottom surface engages base member 18. Accordingly, the wrapper is now transported toward the receiving end of the conveying unit C. Preferably, without pause in its journey, and as described in my aforesaid application, Serial No. 97,198, the coated wrapper is suitably reinforced or tabbed, the exposed faces of the tabs are covered with adhesive, and as the coated tabbed wrapper is moved into engagement with the waiting gripping mechanism at the receiving end of the conveying unit C, the actuating arms of the grippers move into engagement with the abutments or members in this region, whereby the palm members 19 are swung on their pivots to release the coated tabbed wrapper, said grippers continuing their movement without pause until they reach the position indicated at the right of Fig. 1, when rotation of shaft 14 is automatically discontinued and movement of the gripper-carrying chains ceases. By this operation, it will be observed that the other pair of grippers V has been moved into position adjacent the glue-distributing roll 4, and they are now open and awaiting the delivery of another wrapper which will soon be advanced thereinto by the feed roll mechanism 3.

As clearly described in my aforesaid application, but not illustrated herein, the gap between the glue-distributing roll 4 and the receiving end of the conveyor unit C is bridged in part by belt mechanism and in part by rigid supporting or guiding members carried by the transverse tie members 8, some of the latter being adjustable transversely of the path of movement of chain 11 and serving as a non-yielding support for the surfaces of the wrapper to which the tabs are applied and also serving to support the combined tabbed wrapper when adhesive is subsequently applied to the exposed tabbed surface.

A gear 20 intermittently rotated in timed relation with the adhesive-applying unit G drives a gear 21 keyed to a shaft 22 rotatable in a bearing 23 mounted on a frame F and another bearing, not shown, mounted on a frame F1. A bevel gear 24, secured to shaft 22, meshes with and drives a corresponding bevel gear 25 keyed to a shaft 26 mounted in bearings in the frames F1.

When pairs of spaced tabs are to be applied to the coated wrapper along each edge thereof, one pair of such tabs is applied by one tabbing mechanism while another pair is applied by another tabbing mechanism. To this end, two tabbing mechanisms are mounted on shaft 26, and since they are duplicates or substantially so, a description of one will suffice for the other.

Each tabbing mechanism comprises a disk, wheel or the like 27 carrying duplicate tab-gripping mechanisms, each functioning to convey a tab into engagement with the coated wrapper. Mounted on disk 27 is a plate 28, adjustably secured to one side of disk 27 by a bolt 29 or the like passing through a circumferential T-groove or T-slot 30 in the disk, the head of bolt 29 being

confined within the wider slot portion from which it may be removed through a suitable enlarged opening, not shown. Plate 28 forms a bearing for a shaft or pin 31, to which is secured a member 32 having pivoted thereto a member 33 supporting the gripping finger 34 which at times co-operates with a member 35 for gripping a tab. A coil spring 36, Fig. 2, biases member 33 and finger 34 in a clockwise direction, Fig. 2. Member 32 comprises an arm 37 carrying at one end a roller 38 biased in a clockwise direction, Fig 2, by a coil spring 39, or equivalent.

Secured in the T-shaped slot 30 of disk 27 by bolts 29 adjacent each of the duplicate tab-gripping mechanisms are the gear segments 40 and cams 41. Also secured in any suitable manner and in suitable position on the frames F1 are the cams 42 and 43, which co-act with the rollers 38 to move the arms 37 against the expansive force of springs 39 for opening the tab grippers.

Rising from the frames F1 are the frame extensions *f*1 supporting, one for each tabbing mechanism, a reel 44, on which has been wound a web or ribbon *w* of any material suitable for tabbing purposes, for example, a web or ribbon of paper of a grade heavier, lighter or of a weight corresponding with the weight of paper (when paper is used) from which the wrappers S are formed. The web *w* passes in succession over a tension roll 45 supported on a pivotal arm 46, thence over the guiding rolls 47 and 48, and finally into engagement with the feed rolls 49 and 50 mounted on shafts having intermeshing gears 51 and 52, Fig. 2. Feed roll 49 may be supported on a slidable member 53 engaged by a trigger or the like 54 biased in a counterclockwise direction, Fig. 1, by a coil spring 55 or the like confined on a rod 56 linked to trigger 54. Obviously, upon attracting trigger 54 against the expansive force of spring 55, member 53 and roll 49 may be withdrawn toward the left, Figs. 1 and 2, whereupon the end of web *w* may be passed below roll 50, and, when roll 49 and member 53 are replaced, the feeding mechanism will be in operative condition. A gear 57 keyed to the shaft carrying roll 50 meshes with a gear 58 rotatably supported in a suitable manner, as on a shaft having bearings in the frame extensions *f*1, said gear 58 being alternately rotated through a part of a revolution by the gear segments 40, as hereinafter more fully described. A rod 59 or the like pivoted to an arm 60 in turn pivoted to one of the frame extensions *f*1 is mounted for reciprocatory movement on said extension and may be moved alternately in an upward direction against the expansive force of a coil spring 61 or the like suitably confined on said rod when cams 41 in succession engage a roll 62 on arm 60. When rod 59 is thus moved, an arm 63 pivoted to rod 59 is swung in a clockwise direction, Fig. 1, to similarly rotate a shaft 64, whereby the end of an arm 65 is moved toward the left, Fig. 1. In response to such movement of arm 65, sliding engagement is effected between the cutting elements 66 and 67, the former in the example shown being stationarily mounted, and the latter sliding on a plate 68.

Disk 27, by its driving connection described above, is intermittently rotated in a counterclockwise direction, Figs. 1 and 2. The gear segments 40 comprised in one of the tabbing mechanisms by co-action with gear 58 impart rotative movement to roll 50 to feed the end of web *w* downwardly a sufficient distance so that the web portion lying below the cutting element 66 is of the proper tab length. After the web has been thus fed, cam 41 engages roll 62, and imparts movement to rod 59, whereby cutter 67 is moved toward the left, Figs. 1 and 2, to sever the tab. Before the completion of the web-feeding operation aforesaid, fixed cam 42 rocked arm 37 to move finger 34 from member 35, the position of the various parts at that time being as indicated in Fig. 2. As the end of web *w* is fed downwardly, it is deflected by the curved end of plate 68 and assumes the position illustrated in Fig. 2, at which time the web is severed as stated above. Immediately thereafter roller 38 passes beyond cam 42, and spring 39 becomes effective to rotate arm 37 in a clockwise direction, Fig. 2, whereby finger 34 is snapped toward and into engagement with the tab now resting on member 35. Spring 36 is of comparatively light weight, and when used its primary function is that of permitting some relative movement of finger 34 and of member 33 with respect to arm 37, whereby the shock of the impact between finger 34 and member 35 is absorbed to some extent.

The foregoing operation occurs without cessation in the rotary movement of disk 27. In a similar manner, the other tabbing-mechanism on disk 27 is automatically supplied with a tab, and the two tabbing mechanisms without pause of disk 27 deposit or secure the tabs to the coated surface of the wrapper while it moves from the left toward the right, Fig. 1, under the control of a pair of transversely aligned grippers V.

The parts are so timed that as the forward portion of the coated wrapper to which the first tab is to be applied reaches a point substantially vertically below shaft 26, Fig. 1, roller 38 on arm 37 engages fixed cam 43 to release the tab from finger 34 and member 35. Ordinarily, release of the tab occurs just as the advanced tab edge engages the coated surface of the wrapper; surface 35*a* of member 35 then having the

function of ironing or wiping the tab into engagement with the wrapper.

Continued movement of the coated wrapper toward the right, Fig. 1, brings the rear portion of the wrapper to which the second tab is to be applied into the tab-applying position, and the second tab is then applied in a manner similar to that described above.

It shall be understood that shaft 26 carries another disk similar to disk 27 and properly spaced therefrom. This second disk is equipped with tabbing mechanisms of the character described above and in transverse alignment with the tabbing mechanisms on the disk 27, whereby a pair of tabs or reinforcing elements may be applied to the other edge of the coated wrapper as it passes from the left toward the right, Fig. 1.

After the tabs have thus been applied, the tabbed wrapper continues movement toward the right, Fig. 1, and during such movement there is applied to the exposed tabbed surfaces a suitable coating of adhesive.

The tab-coating mechanism described herein is of the character illustrated and described in my aforesaid application, Serial No. 97,198, and accordingly, the shaft 26 has secured thereto a gear 69 meshing with and driving an idler gear 70 rotatably mounted on a stud shaft 71 carried by one of the frames F1, said gear 70 meshing with and driving a gear 72 keyed to a shaft 73 extending transversely of and rotatably mounted in bearings in frames F1.

Gear 72 on shaft 73 meshes with and drives the idler gear 74 mounted on a stub shaft 75 in a frame F1, the latter gear meshing with and driving the corresponding idler gear 76 mounted on a second stud shaft 77 carried by said frame F1. Idler gear 76 meshes with and drives a gear 78 keyed to a shaft 79 carrying two spaced glue rolls 80, the periphery of said glue rolls passing through adhesive or glue contained in a receptacle 81 mounted on a support 82 secured in suitable manner to the frames F1.

Carried by the shaft 73 is a pair of disks 83, each in alignment longitudinally of the machine with a disk 27. In the example illustrated, disks 83 are duplicates or substantially so, and each is provided with a circumferential groove 84 receiving the flanged extremities of the frames of a pair of spaced stencils 85, each of which may be secured in a desired position circumferentially of the disk 83 by a bolt 86 or the like passing through the stencil frame and clamping a member or plate 87 to the disk periphery and also to the stencil.

By the train of gears described above, disk 83 and glue rolls 80 are rotated in unison with the disks 27. Stencils 85 move with disk 83, and accordingly are brought successively into engagement with a glue roll 80, whereby there are transferred to their outer curved surfaces coatings of adhesive or glue. When properly adjusted along the periphery of disk 83, the stencils 85 successively engage the tabs on the coated tabbed wrapper passing from left toward the right, Fig. 1, to apply an adhesive coating to the exposed faces of the tabs.

The foregoing tab-coating operation is performed without pause in the travel of the coated tabbed wrapper toward the right, Fig. 1, after application of the adhesive coatings to the tabs, movement of the coated tabbed wrapper continues until it is released from the grippers V after being deposited in the waiting gripping mechanism at the receiving end of the conveying unit C, as hereinafter more fully described.

In the example illustrated, the conveying unit C and wrapping machine W are of the same general type disclosed in the aforesaid Federwitz and Bailey application, Serial No. 40,769, with the exception that in lieu of the box-feeding mechanism disclosed in that application, the conveying unit C is provided with mechanism for feeding, shaping and assembling the various box-forming components.

As illustrated in Fig. 3, the wrapping machine W comprises a frame or housing 88 in the lower portion of which is mounted a barrrel cam 89 with which is associated the gear 90 driven by the worm 91 secured to the drive shaft 92. As well understood in the art, the lower form block or platen 93 moves downwardly under the influence of the intermediate and upper form blocks 94 and 95 as the latter is moved in the same direction by the cam 89, which also controls the various wrapper-applying instrumentalities or tools, herein shown in Fig. 3 as comprising the rollers 96 for forcing the wrapper side panels into intimate contact with the respective box sides, the corner lap turn-in members 97, the brush and roll structures 98 and 99 for folding the wrapper and panels into intimate contact with the respective box ends, the turn-in fingers 100, and the presser bars 101.

The wrapping machine W is supported on a base 102, preferably of sufficient area to be utilized as a support for the conveyer unit C.

Received in a frame or housing 103 is a barrel cam 104 secured to a shaft 105 having bearings in opposite walls of the housing. Shaft 105 also has secured thereto a gear 106 which meshes with a worm 107 keyed to a shaft 108 having bearings in the housing 103 at 109, and 110, Fig. 5. At one end of shaft 108 is a bevel gear 111 meshing with a corresponding bevel gear 112 keyed to a shaft 113, which, and shaft 92, are driven from any suitable source of

power, not shown, the power preferably being applied to a pulley 114 adapted to be connected to said shafts 92 and 113 by the clutch element 115.

Rising from the housing 103 and suitably secured thereto, as by the bolts 116, are the conveyer unit side frames 117 and 117*a*, Fig. 5. Secured to the upper flanged extremities of said side frames are the spaced bridge members or arches 118 and 119, Figs. 3 and 5.

Extending transversely of and secured to the side frames 117 and 117*a* are the rods or members 120, Figs. 3 and 4, upon which are slidable the conveyer frames 121 and 121*a*. Adjustment of the conveyer frames along the tie members 120 may be effected in any suitable manner. Preferably, however, there is utilized adjusting mechanism of the character described in the aforesaid Federwitz and Bailey application, Serial No. 40,769, for simultaneously effecting equal adjustments of each conveyer frame toward and from an imaginary line disposed midway between the side frames 117 and 117*a* and entending longitudinally thereof.

Each conveyer frame 121 and 121*a* at its end adjacent the wrapping machine W supports a laterally extending stub shaft 122, upon which a sprocket wheel 123 is rotatably mounted. The end of each conveyer frame at its end removed from the wrapping machine supports a similar laterally extending stub shaft 124, each rotatably supporting a wheel 125 similar to wheel 123. Passing over the respective pairs of wheels thus mounted on the conveyer frames 121 and 121*a* are the belts, bands, chains or the like 126 and 126*a*, Fig. 5, whose lower spans are supported, respectively, by members 127 and 127*a* carried, respectively, by the conveyer frames 121 and 121*a*.

Spaced equidistantly along chains 126 and 126*a* and aligned transversely thereof are the pairs of wrapper-gripping units, each unit preferably being of the type disclosed in the aforesaid Federwitz and Bailey application, Serial No. 40,769, and, therefore, comprising a movable actuating arm 128 terminating in a palm 129, which, for gripping a wrapper, co-acts with an edged disk or wheel 130 rotatably mounted on a stud secured to a bracket 131 carried by a chain link pin.

Shaft 105 extends exteriorly of the housing 103, and has secured thereto the bevel gear 132, Figs. 3 and 4, which mesh with and drive a corresponding bevel gear 133 keyed to one end of a shaft 134 having bearings in the housing 103 at 135 and 136. To the other end of shaft 134 is keyed a bevel gear 137 meshing with and driving a corresponding bevel gear 138 keyed to one end of a shaft 139 having one bearing 140 secured to housing 103 and another bearing 141 secured to side frame 117*a*. At its other end, shaft 139 carries a bevel gear 142 meshing with and driving a corresponding bevel gear 143 keyed to a shaft 144 having bearings in the side frames 117 and 117*a* and with respect to which the conveyer frames 121 and 121*a* are freely slidable. Exteriorly of each conveyer frame, shaft 144 has gears 145 and 145*a* keyed, which gears mesh, respectively with gears 146 and 146*a* keyed, respectively, to the shafts 147 and 147*a* extending parallel with and rotatably mounted, respectively, on the conveyer frames 121 and 121*a*. The gearing between shafts 147 and 147*a*, and their source of power is so designed that they rotate once, and once only for each cycle of operation of the wrapping machine and, hence, these shafts are styled "one-time" shafts.

In lieu of the mechanism described in the aforesaid Federwitz and Bailey application, Serial No. 40,769, for effecting intermittent movement of the wrapper-conveyer chains of the conveyer unit, there is utilized mechanism, which, while performing the same function, is of a specifically different character. To this end, the cam 104 is provided with a groove or track 148 receiving a follower 149 carried by a member 150 whose ends are apertured and slidably mounted on the rods or bars 151 and 152 supported in the walls of housing 103. Member 150 comprises the upwardly extending lugs 153 and 154, Fig. 5, recessed to receive a rod or member 155 whose ends project through slots 156 formed in the front and rear walls of housing 103.

Loosely mounted on the ends of member 155 are the links 157 and 157*a* connected, respectively, by pins 158 and 158*a* to the levers 159 and 159*a*, one end of each of the latter being secured to a shaft 160 having bearings in opposite side walls of housing 103. At their upper ends, levers 159 are pivotally connected, respectively, to links 160 and 160*a*, in turn pivotally connected, respectively, to the pins or threaded members 161 and 161*a* extending through slots 162 and 162*a* in the conveyer frames 121 and 121*a* and secured respectively, to the I-shaped members 163 and 163*a* mounted, respectively, for reciprocatory movement on the conveyer frames 121 and 121*a*. To the end that members 163 and 163*a* may be guided along the conveyer frames 121 and 121*a*, there are utilized the bars or members 164 and 164*a*, Fig. 9, held fixed with respect to the respective conveyer frames in any suitable manner, preferably by utilizing the same screws 165 or the like that hold the chain guides on the conveyer frames. To this same end, each conveyer frame has secured thereto a plurality of brackets 166, Figs. 3 and 4, so arranged as to extend over and partly around the members 163 and 163*a*.

Referring to Figs. 9 and 10, the members 163 and 163*a* are shown as provided, respectively, with the slots 167 and 167*a* receiving the clamping members or screws 168 and 168*a* threaded, respectively, into the carrier members 169 and 169*a*. Latch members 170 and 170*a* are mounted for reciprocatory movement, respectively, in the cylindrical passages comprised in each carried member, said latch members comprising, respectively, the lateral extensions 171 and 171*a* received, respectively, in the channels 172 and 172*a* of actuating members 173 and 173*a* pivoted to the respective guiding brackets 174 and 174*a* suitably secured, respectively, to the conveyer frames 121 and 121*a*. The channeled extensions of actuating members 173 and 173*a* are biased in an upward direction, Fig. 9, by the respective springs 175 and 175*a* to move the forked ends of the latch members 170 and 170*a* from engagement with individual link pins of each of the chains 126 and 126*a*, into which position said latch members are periodically moved by the cams 176 and 176*a* mounted, respectively, on the one-time shaft 147 and 147*a*, said cams engaging the respective rollers 177 and 177*a* disposed, respectively, on the arms 178 and 178*a* of actuating members 173 and 173*a*.

Under the influence of cam track 148, levers 159 and 159*a* are periodically oscillated and, through the links 160 and 160*a*, the members 163 and 163*a* are moved toward and from the wrapping machine, extensions 171 and 171*a* meanwhile sliding in their respective channels 172 and 172*a*. Cams 176 and 176*a* are so positioned on the one-time shafts that just prior to beginning of movement of bars 163 and 163*a* toward the wrapping machine, the actuating members 173 and 173*a* are rocked on their respective pivots and the forked ends of latch members 170 and 170*a* are moved into engagement, each with a link pin on the chains 126 and 126*a*. Accordingly, as members 163 and 163*a* are moved toward the wrapping machine, chains 126 and 126*a* are similarly moved. Just as forward movement, as aforesaid, of members 163 and 163*a* ceases, the high points of cams 176 and 176*a* pass from engagement with their respective rollers 177 and 177*a* and springs 175 and 175*a* become effective to move the latch members 170 and 170*a* upwardly, Figs. 9 and 10. Accordingly, chains 126 and 126*a* remain in the position to which they have just been advanced while the members 163 and 163*a* move from the wrapping machine under the influence of cam 104.

Referring to Fig. 5, the cam 104 is shown as comprising the track or groove 179 receiving the follower 180 carried by one end of a lever 181 keyed or pinned to a shaft 182 suitably supported in the side frame 117*a*. Oscillated by shaft 182 are two levers 183 and 184. Lever 184 is pivoted to one end of a link 185, to whose other end is pivoted one end of a lever 186 oscillatory on a rod 187 supported by the arches 118 and 119. Pivoted to the other end of lever 186 is one end of a link 188, whose other end is pivoted to the stem 189 of a plunger P1, the said stem being supported for reciprocatory movement in a centrally disposed passage in the arch 118.

The aforesaid lever 183 of substantially less length than lever 184 is pivoted to one end of a link 190, to whose other end is pivoted one end of a lever 191 substantially longer than lever 186 and likewise oscillatory on rod 187. Pivoted to the other end of lever 191 is one end of a link 192, whose other end is pivoted to the stem 193 of a plunger P2, said stem 193 being supported for reciprocatory movement in a centrally disposed passage in arch 119 in longitudinal alignment with the passage in arch 118 receiving stem 189.

Accordingly, in response to rotation of cam 104, plungers P1 and P2 are caused to reciprocate in unison, the stroke of the former being substantially longer than the stroke of the latter, due to the fact that levers 184 and 191 are substantially longer than levers 183 and 186.

Referring to Fig. 11, the upper flanged extremities of the conveyer frames 121 and 121*a* are shown as forming a support for a table or hopper 194 whose side extensions are slotted at 195 for the reception of screws 196 or the like which, when tightened, hold the hopper rigidly on the conveyer frames 121 and 121*a*. Obviously, upon slight retraction of screws 196, the conveyer frames may be transversely adjusted despite the fact that such frames function as a support for the hopper 104, and are normally rigidly secured thereto.

Stacked within the hopper 194 are the box-forming components or elements A, each of which is destined to form the bottom, front and rear walls of a box. Components A may be of any suitable material, as box-board paper, paste-board or the like.

The reciprocatory members 163 and 163*a* adjacent their ends removed from the wrapping machine are provided with the transversely aligned slots 197, Figs. 3, 4 and 11, through which pass screws 198 or the like for respectively securing the pusher bars 199 and 199*a* to said members 163 and 163*a*. As illustrated, the vertical portions of said pusher bars are connected by a rod 200 or the like, to which, midway between bars 199 and 199*a*, is secured a member or finger 201 having an angular recess receiving the edge of a box-forming component. The upper angular portion of finger 201 slides in a slot 201*a* in the bottom of hopper 194. The horizontal portions 202 and 202*a* of the

pusher bars comprise, respectively, the offset fingers 203 and 203*a* utilizable in the box-forming operation, as hereinafter described.

Referring to Figs. 3, 4 and 12, the upper flanged extremities of the conveyer frames are shown as having secured thereto in any suitable manner, as by the screws 204, the respective plate members 205 and 205*a*, to whose bottom surfaces are respectively pivoted the plates 206 and 206*a*, each biased in an upward direction, as viewed in Fig. 12, by springs 207 or the like. The outer edges of the pivoted plates 206 and 206*a* extend beyond the outer surfaces of the plates 205 and 205*a* to form a support for the cardboard section A as it is initially moved toward the wrapping machine by finger 201.

Referring to Figs. 3, 4, 12 and 14, a pair of form plates 208 and 208*a* are shown as secured to the respective conveyer frames 121 and 121*a* in any suitable manner, as by the screws 209 and 209*a* passing through slots (one of which, slot 210*a*, is shown in Fig. 14) in said form plates, which preferably, respectively, comprise vertical and horizontal portions, the latter having the respective upwardly extending projections or stop members 211 and 211*a* extending therefrom. The pair of form plates 208 and 208*a* aforesaid are secured to the conveyer frames so that their horizontal portions lie just beyond the path of the face of plunger P2 nearest to the wrapping machine. Just beyond the opposite face of plunger P2 or that one nearest the adhesive applying unit G, are the form plates 212 and 212*a* secured to the conveyer frames in the same manner as are the form plates 208 and 208*a*. Both pairs of form plates are identical except that plates 212 and 212*a* are not provided with the extensions 211 and 211*a*.

Referring to Fig. 12, there are shown as respectively secured to the lower surfaces of the upper flanged extremities of the conveyer frames 121 and 121*a* the members or brackets 215 and 215*a*, whose upturned free ends are perforated to receive the shaft of the upper forming roll 216. Disposed beneath said roll 216 and spaced a suitable distance therefrom is the lower forming roll 217 mounted on a shaft 218 having bearings in the side frames 117 and 117*a*. It shall be understood that rolls 216 and 217 are of such length that pusher bars 202 and 202*a* may readily pass to either side thereof when moving to shape a box-forming component A, as hereinafter described.

Mounted, respectively, on the conveyer frames 121 and 121*a* beneath the plunger P1 are the brackets 219 and 219*a*, to whose lower horizontal surfaces are pivoted, respectively, the supporting plates 220 and 220*a*, said plates being biased in an upward direction, as viewed in Fig. 5, by leaf springs 221 or equivalent. The outer edges of supporting plates 220 and 220*a* extend outwardly at greater distances than do the outer edges of brackets 219 and 219*a*, to form a support for the shaped box-forming component A as it is moved into the path of plunger P1 as hereinafter described. Preferably, the plates 220 and 220*a* are curved downwardly as indicated at 222, Figs. 3 and 4, to facilitate the passage thereon of the shaped box-forming component A as it is passed thereon by the pusher bars 202 and 202*a*. Plates 220 and 220*a* are also provided with stop members 223, Figs. 3 and 4, longitudinally adjustable thereon. Preferably, the lower portions of brackets 219 and 219*a* conform in configuration to the brackets 166 and augment these brackets in guiding the reciprocatory members 163 and 163*a*.

Referring to Fig. 8, the reciprocatory members 163 and 163*a* are shown as provided with slots 225 through which pass the screws or fastening members 226 for holding one pair of spaced arms 227 in desired adjusted position on members 163 and another pair of spaced arms 227 in adjusted position on member 163*a*. To each of the arms 227 there is pivoted at 228 a finger comprising two walls 229 and 230 meeting in a right-angled corner, both of which are flared outwardly at the top for the reception of the box-forming components, and only one of which, namely, wall 230 is provided with a palm or projection 231 to be engaged by the lower surface of a box-forming component, Fig. 7. Each of the aforesaid fingers is biased by a spring pressed plunger or member 232 in such direction that a part 233 thereof engages a stop member 234 carried by the adjacent arm 227.

As illustrated in Figs. 3, 4 and 5, the plunger P1 comprises a chamber having one or more apertures 235 in opposite front and rear walls thereof, that is, those walls which are substantially parallel with the conveyer frames 121 and 121*a*. The aforesaid chamber opens into stem 189 to which is connected a conduit 236 leading to a valve 237, Fig. 13, actuated as hereinafter described.

Referring to Fig. 5, on the upper horizontal extremities of the conveyer frames 121 and 121*a* are secured, respectively, the supporting members 238 and 238*a*, each supporting a stack of box-forming components B destined to form the end walls of the box and of the same material as component A. Slidably mounted on each of the supporting members 237 is a pusher member 239, each of which is biased into engagement with the outermost box-forming component of a stack by a wire, cord or other flexible member 240 passing over pulleys or the like 241 and having a weight 242 secured to its end. As will readily be understood,

weights 242 thrust the members 239 and the stack of box-forming components B toward opposite walls of plunger P1. Secured to the upper surface of plunger P1 are the members 243, each having a plane surface included in a plane parallel with the adjacent face of plunger P1 with which the stack of cardboard elements B engages but projecting beyond said face a distance substantially the same as the thickness of one of said elements.

Referring to Fig. 13, the valve 237 comprises a chamber with which communicates a conduit 244 leading to a suction pump or the like, not shown. Mounted for reciprocatory movement within the aforesaid chamber is a sleeve or cylindrical member 245 having the ports or passages 246 and 247, the former for one position of the sleeve registering with conduit 236 and the latter for another position of the sleeve registering with a passage 248 in the chamber wall. Sleeve 245 terminates in a stem having mounted thereon a roller 249 with which coacts a cam 250 on the one-time shaft 147*a*.

Referring to Figs. 3 and 4, the shaft 105 is shown as having secured thereto exteriorly of housing 103 the gear 251 with which meshes a gear 252 keyed to a shaft 253 disposed in a bearing bracket 254 carried by the aforesaid housing. Carried by shaft 253 is a cam 255 which, once for each cycle of operation of the wrapping machine, engages the roller 256 carried by one end of a lever 257 pivoted to a bracket 258 also carried by housing 103. Lever 257 at its other end is secured to one end of a rod, link, or the like 259 which at its other end is secured to a member 260 controlling operation of the adhesive-applying unit G.

For supporting the coated tabbed wrappers as they are advanced step-by-step toward the wrapping machine W, there may be utilized the intermittently movable conveyor 261, Figs. 3 and 4, operated, for example, as disclosed in the aforesaid Federwitz and Bailey application, Serial No. 40,769.

As soon as a pair of wrapper grippers V, carried by the chains 11, deposit a coated tabbed wrapper in an awaiting pair of grippers on the chains 126 and 126*a* of the adhesive-applying unit C, the cams 176 and 176*a* engage at their high points respectively, with the rollers 177 and 177*a*, thereby rocking levers 178 and 178*a* to depress the latch members 170 and 170*a*, which at their forked ends engage link pins of the chains 126 and 126*a*. Immediately thereafter groove 148 of cam 104 becomes effective to rock levers 159 and 159*a* in a clockwise direction, Fig. 3, to move members 163 and 163*a* toward the wrapping machine, thereby likewise advancing chains 126 and 126*a* and the wrapper toward said machine. Upon cessation of this movement another pair of grippers on the chains 126 and 126*a* will have been advanced into wrapper-receiving position at the receiving end of the conveyor unit to which there is soon delivered another coated tabbed wrapper, which is thereupon advanced toward the wrapping machine as described above. Thus, intermittently coated tabbed wrappers are advanced individually and in succession from left toward right, by the chains 126 and 126*a*, Fig. 3.

Co-incidentally with the aforesaid movement of members 163 and 163*a* from left toward the right, finger 201 carried by pusher bars 199 and 199*a* moves in the same direction, Fig. 3, to remove the lowermost box-forming component A from the stack of such components and advance the same along the plates 206 and 206*a* until engagement is effected with the stop members 211 and 211*a*, in which position the said box-forming component is positioned beneath the plunger P2. Members 163 and 163*a* then move in reverse direction or from right toward the left, Fig. 3, to retract the finger 201.

As soon as the box-forming component is positioned as above described, groove 179 of cam 104 rocks lever 181 and through the parts hereinbefore described, plunger P2 is moved downwardly and carries the box-forming component between the pairs of form plates 208, 208*a* and 212, 212*a* into engagement with the horizontal portions 202 and 202*a* of the pusher bars, the leaf springs 207, Fig. 12, yielding to permit rotatable movement of plates 206 and 206*a* out of the path of the descending box-forming component and the plunger P2.

Each of the box-forming components A are usually scored or creased along lines defining the box bottom and hence when passing between the aforesaid pairs of form plates the descending box-forming component is caused to assume a U-shaped configuration such as indicated by the broken lines in Fig. 3.

Upon completion of the foregoing operation, and as plunger P2 is on its upward stroke, members 163 and 163*a* again carry pusher bars 202 and 202*a* toward the wrapping machine, the fingers 203 and 203*a* engaging the rear wall of the shaped component to move the same toward the wrapping machine. As a result, the front box wall is passed between the rollers 216 and 217, and deflected or bent inwardly upon the box bottom to thereby weaken or partially fracture the tissue along the front scored portion. Due to the pressure thus effected at the front of the box, the rear box wall is forced inwardly by fingers 203 and 203*a* into an angular position above the box bottom and in this position passes between the rollers 216, 217 similarly weak-

ening or partially fracturing the tissue along the rear scored portion of the box-forming component. After passing through the aforesaid rolls 216 and 217, the shaped box-forming component engages the grooved ends 222 of plates 220 and 220*a* by which it is guided into engagement with the stop members 223, at which time the box-forming component is positioned beneath the plunger P1. The direction of movement of members 163 and 163*a* is now reversed and they move from right toward the left, Fig. 3, to carry the pusher bars 202, 202*a* and structure associated therewith in the same direction, friction between the box component A and the plates 220 and 220*a* preventing movement of the former by the pusher bars.

Cam 250 will now have moved to such position that its high point engages roller 249 to move sleeve 245 into the position illustrated in Fig. 13 whereby the chamber in plunger P1 is in communication through stem 189 and conduits 236 and 244 with the source of suction, not shown. Accordingly, on opposite front and rear faces of plunger P1 there is caused to adhere an individual box-forming component B.

Soon after movement of pusher bars 202 and 202*a* from right to left was initiated as last described, groove 179 of cam 104 again rocked lever 181 and through the chain of parts hereinbefore described plunger P1 descends, carrying a pair of box-forming components B into the shaped box-forming component A, said components B forming two opposite walls of the box. Without pause in its downward movement plunger P1 carries the various box-forming components downwardly, springs 221 yielding to permit rotatable movement of plates 220 and 220*a* out of the path of the component A, until finally the assembled structure is positioned within the four fingers each of which comprises the walls 229 and 230 meeting in a right-angled corner. When thus positioned, the box-forming components B engage the relatively plane walls 229 and the vertical walls of the box-forming component B engaging the walls 230 with the box bottom resting upon the palms 231.

At this time the high point of cam 250 passes from engagement with roller 249 and the suction effect of the chamber in plunger P2 is eliminated. Thereafter, plunger P2 ascends, and the components are held in box-forming position within the various aforesaid fingers by the spring-pressed plungers 232.

Immediately thereafter, movement from left toward the right, Fig. 3, of members 163 and 163*a* is again initiated and the structure comprising the arms 227 and fingers carried thereby is moved in the same direction to transport the assembled box-forming components beneath the upper and intermediate form blocks 95 and 94 of the wrapping machine.

Coincidentally with the delivery of the assembled box-forming components as last described, the chains 126 and 126a delivered a coated tabbed wrapper into the path of the upper and intermediate form blocks, Fig. 7, in which position after release by the wrapper grippers it may be retained in any suitable manner, for example, as disclosed in the aforesaid Federwitz and Bailey application, Serial No. 40,769.

The mechanism is so timed that upon positioning of the assembled box-forming components and the coated tabbed wrapper as described above, the upper and intermediate form blocks descend toward the box structure, each component B entering the space between a face of the form block structure and a clip or spring element 262 secured to a bracket 263 carried by the transverse rod structure 264 connected to and movable with the upper form block 95. Without pause in its downward movement, the upper and intermediate form blocks carry the assembled box-forming components out of the four fingers, each of which comprises the walls 229 and 230, the spring controlled members 232 yielding sufficiently to permit passage of the bottom of component A past the palms 231. While thus moving downward as last described, each component B is held in engagement with a face of the upper and intermediate form blocks by a spring clip 262 while the vertical walls of the component A are forced into and maintained in engagement with opposite faces of said form blocks in the usual manner, as by flexible brush structure of the character disclosed in Federwitz and Bailey Patent No. 1,541,036, aforesaid.

Eventually, the bottom of component A is carried into engagement with the coated tabbed surface of the wrapper S and thereafter the combined box-forming structure, after engaging the lower form block 93, is carried successively into engagement with the various wrapper-applying tools and instrumentalities which operate upon the tabbed wrapper in their well-known and intended manner. As well understood in the art, the upper form block 95 is separated from the lower form block 94 before the partially wrapped structure reaches the end brush and roll structure 98 and 99 for the box end walls lifting the spring fingers 262 out of the path of movement of mechanism for applying the proper wrapper panels to the box end walls.

On its upward journey and near the completion of its cycle of operation, the upper and intermediate form blocks 94 and 95 may carry the wrapped box into engagement with the stripper brush structure 265, Fig.

3, which functions to remove the box from said form blocks.

It will be understood that as members 163 and 163*a* move toward and from the wrapping machine, the pusher bars 199, 199*a*, the pairs of arms 227 and all of the structure associated therewith likewise move toward and from the wrapping machine. It will also be understood that plungers P1, P2 reciprocate in unison. Accordingly, in the operation of the mechanism, as finger 201 moves toward the wrapping machine to advance a box-forming component A toward the plunger P2, a shaped component A, is carried by the horizontal pusher fingers 202, 202*a* from beneath plunger P2 through the rolls 216 and 217 into position beneath the plunger P1. At the same time the pairs of arms 227 carried respectively by the reciprocatory members 163, 163*a* transport a group of assembled box-forming components from beneath the plunger P1 into the path of the upper and intermediate form blocks 95 and 94.

Plungers P1 and P2 likewise reciprocate in unison and, therefore, as plunger P2 passes a box-forming component A between the pairs of form plates 208, 208*a* and 212, 212*a*, the other plunger P1 is carrying a pair of components B downwardly toward the shaped component A resting on the plates 206, 206*a* and thereafter carrying the assembled box-forming components into the fingers carried by the pairs of arms 227.

It shall be understood that the parts of the entire mechanism are so timed or synchronized that all of the various operations described above are performed in the proper time or sequence. Thus, due to the provision of the rod or link 259, the adhesive-applying unit G is intermittently tripped at the proper times to effect the delivery of an adhesively coated sheet to the pairs of grippers V on the chains 11. Likewise, the tab-applying mechanism illustrated in Fig. 1 is so timed or related to the drive mechanism of the adhesive applying unit G that tabs are applied in the proper regions to the coated wrappers as they are transported individually and in succession beneath the tab-applying mechanism.

Furthermore, the timing is such that members 163, 163*a* intermittently advance chains 126 and 126*a* to position where pairs of wrapper grippers waiting at the receiving end of the conveying unit C will receive and grip coated tabbed wrappers delivered to that region by pairs of grippers V on the chains 11.

The cam grooves 148 and 179 on cam 104 are so related that the plungers P1 and P2 perform their intended function in the proper timed relation with respect to the movement of reciprocatory members 163, 163*a*.

Due to the timed or synchronized action of the various mechanisms as thus effected, individual tabbed coated wrappers and individual groups of assembled box-forming components are delivered in superposed position into the path of the form-block structure of the wrapping machine, while the upper and intermediate form blocks are in their upper region of travel. As heretofore stated, immediately upon thus positioning the various structures aforesaid, said form blocks descend to carry the same through the wrapping machine.

As herein illustrated and described, the various mechanisms entering into the complete organization are freely adjustable to care for different problems presented in the box wrapping industry, particularly as regards differences in dimensions of the tabs, wrappers and box-forming components to be utilized.

It is well understood in the art that wrappers of any desired configuration and of selected dimensions may be fed through an adhesive-applying unit of the character illustrated in Fig. 1.

As described herein and more particularly as described in my aforesaid application, Serial No. 97,198, the tab-applying mechanisms may be adjusted as to secure the application to the wrapper of tabs of a desired size, and may be further adjusted to provide for the application of the tabs to desired regions or areas of the wrapper. To accommodate any adjustment of the character last described, stencils on the disks 83 may be adjusted circumferentially thereof and likewise said disks may be adjusted longitudinally of shaft 73.

As particularly described in the aforesaid Federwitz and Bailey application, Serial No. 40,769, the conveyer frames 121, 121*a* may be transversely adjusted and the chains 126, 126*a* may be adjusted longitudinally of the conveyer frames to care for any particular dimension of wrapper that may be fed to the aligned wrapper grippers on the conveyer unit chains.

To accommodate different sizes of box-forming components A, the various elements entering into the hopper assembly may be adjustably mounted longitudinally and transversely of the conveyor frames 121, 121*a*. To accommodate box-forming components A of different dimensions, the fingers 211 in conjunction with the form plates 208, 208*a* may be adjusted longitudinally of the machine. Likewise the other form plates 212, 212*a* may be similarly adjusted.

The various structures operated by the reciprocatory members 163, 163*a* may be adjusted longitudinally thereof. Thus, the pusher bars 199, 199*a* may be adjusted by reason of the pin and slot connection 198,

197, and the pairs of arms 227 carrying the finger structure for supporting the assembled box-forming components may be similarly adjusted upon retraction of screws 226. Further, by loosening screws 168, 168*a*, Fig. 9, the carrier members 169, 169*a* for the latch members 170, 170*a* may be adjusted in either direction longitudinally of the conveyer unit, thereby shifting the regions in which the wrapper-grippers on chains 126, 126*a* come to rest.

Transverse adjustment of the conveyer frames 126 and 126*a*, as aforesaid, results in similar adjustment of the reciprocatory members 163, 163*a* and all of the mechanisms operated or controlled thereby, and also results in transverse adjustment of the plates 206, 206*a* and 220, 220*a* for guiding or supporting the box-forming component A; the chains 126, and the one-time shafts 147, 147*a*; the supporting structure for the stacks of box-forming components B; and the supporting arms for roll 216.

The various form blocks 93, 94, 95, P1 and P2 may be so constructed that their dimensions may be changed at will, or, and preferably, therewill be provided sets of form blocks whose dimensions in each set are suitably graduated to care for any condition that may arise. Likewise, there should be provided sets of rolls 216 and 217 of different lengths.

As hereinbefore stated, my invention comprehends the application of an untabbed wrapper, as well as a tabbed wrapper to hold the several box-forming components in box-forming position.

In accordance with this phase of my invention, there is illustrated in Fig. 4 an adhesive applying unit G1 conforming substantially with the unit G illustrated in Fig. 1. As indicated in Fig. 4, the unit G1 is driven by any suitable source of power, not shown, and at predetermined intervals its suction roller 1, or other wrapper conveying device, functions to deliver single wrappers S1 in succession from the stack 2 of unglued wrappers, the wrappers after passing through the rotary feed roll mechanism 3 successively engaging the glue distributing roll 4 which engages the glue drum 5 so mounted as to rotate with its lower surface immersed in adhesive contained in the receptacle 6. The glue distributing roll 4 rotates in a counter-clockwise direction, Fig. 4, to adhesively coat the wrappers fed into engagement therewith by the feed roll mechanism 3. The advanced edge of a wrapper as it leaves the glue distributing roll 4 engages the stripper members 6*a* by which it is deflected on to the wrapper conveying belts 266 rotatably mounted on the idler pulleys 267 and 268. As well understood in the art, belts 266 may be driven by the drive rolls 269 and 270 journaled in the throw-back frame of the unit G1. Rolls 269 and 270, once for each cycle of operation of the adhesive-applying unit G1 are rotated to move the upper spans of belts 266 from left toward the right, Fig. 4, to transport a coated wrapper toward the delivery end of the conveying unit C, all as described in the aforesaid Federwitz and Bailey application, Serial No. 40,769.

In all respects save the omission of the tab-applying and tab-coating mechanisms, the box-forming system of Fig. 4 is identical with the system hereinbefore described for applying tabbed coated wrappers to box-forming components. In view of this fact, the description heretofore recited will suffice for the conveying unit and wrapping machine illustrated in Fig. 4.

It shall be understood that wrappers of any desired configuration and of any suitable material, as paper or equivalent, may be utilized for performing the wrapping operation. Merely by way of example, such wrappers may be of the character disclosed in a prior patent to myself and another, No. 1,265,273, granted May 7, 1918, or as shown in my co-pending application, Serial No. 89,127 filed Feb. 18, 1926, wherein there is disclosed a composite wrapper comprising a plurality of component elements secured to each other.

When utilizing tabbed wrappers in the box-wrapping operation, in lieu of the arrangement hereinbefore described, the stack supported by the table of the adhesive applying unit G, Fig. 1, may be formed of individual wrappers, properly tabbed, of the general character illustrated in my prior Letters Patent 845,205, in which case the tab-applying and tab-coating mechanism illustrated in Fig. 1 may be omitted, since, with this alternative arrangement, a coated tabbed wrapper with adhesive applied to the exposed faces of the tabs is delivered from the glue distributing roll 4 to the awaiting pair of grippers V. Or, and also in lieu of the arrangement hereinbefore described and as described in my aforesaid application, Serial No. 97,198, in the adhesive-applying unit G, tabs may be applied to individual wrappers before passage thereof from said unit, and more particularly, while stacked and before application of an adhesive coating to the wrapper.

No matter what type of wrappers are utilized, whether untabbed or tabbed, it is desirable that the application of the wrapper to the box-forming components be effected before the adhesive coating or coatings has or have materially hardened or set.

The wrapper conveying mechanism illustrated in Fig. 1 as comprising chains 11 and wrapper grippers V is preferably of the character illustrated in Federwitz and Bailey application, Serial No. 70,462, filed

November 21, 1925, and, therefore, operates at relatively high speed to transfer the coated wrappers from the glue distributing roll of the adhesive-applying unit to the receiving end of the conveyor unit. During the short period of time that thus lapses, the condition of the adhesive coating does not substantially change, but subsequently, during the step-by-step movement of the wrapper under the control of the chains of the conveying unit C, the wrapper adhesive coating may undergo some change, that is, it may become "tacky" and, therefore, particularly when care has been exercised in the selection of the quality of the adhesive, the wrappers upon arrival of the wrapping machine have their adhesive coatings of the proper and desired consistency, but in no case should such coating have substantially hardened or set.

For brevity in the appended claims, the term "box" is employed in a generic sense to include open and closed cartons, containers, boxes, and box tops or covers, and unstayed boxes or box blanks; the term "wrapper" is employed in a generic sense to include individual simple and composite wrapping or covering sheets, covers or labels, of paper or other suitable material; the term "tab" is employed generically to include reinforcing elements, strips or sheets of paper, cloth or other suitable material of any suitable form, extent and thickness; the application of tabs to a wrapper or a tabbed wrapper to a box with adhesive and the application of adhesive to tabs and wrapper comprehends the use of material which at the time of application is adhesive or rendered adhesive; and the term "fluid" as applied to the adhesive or adhesive coatings is employed generically to include the condition of the adhesive, whatever its character, before it sets, hardens or dries.

Although the foregoing description is limited to the formation of a box from a specified number of box-forming components, sections or elements, it shall be understood that my invention comprehends the utilization of a greater or smaller number of such components. Further, it shall be understood that my invention also comprehends the manipulation and assembly of a desired number of box-forming components in other ways specifically different from the corresponding disclosure of this application.

What I claim is:

1. The method of forming a box, which comprises applying an adhesive-coated individual corner-cut wrapper to a plurality of separate, unattached box-forming components while temporarily holding them in box-forming position with the corner-laps at the ends of the wrapper side panels overlying the respective end walls of the box.

2. The method of forming a box, which comprises applying an individual tabbed wrapper to a plurality of separate, unattached box-forming components while holding them in box-forming position.

3. The method of forming a box, which comprises assembling a plurality of separate, unattached box-forming components in box-forming position, and thereafter applying an individual tabbed wrapper to said components with the tabs overlying corners of the box.

4. The method of forming a box, which comprises applying an individual adhesive-coated tabbed wrapper to a plurality of separate, unattached box-forming components while holding them in box-forming position.

5. The method of forming a box, which comprises bringing a plurality of separate, unattached box-forming components into box-forming position, and thereafter applying an individual tabbed adhesive-coated wrapper to said components with the tabs overlying corners of the box.

6. The method of forming a box, having a plurality of side walls and a bottom, which comprises, in any sequence, the steps of applying tabs to a wrapper with adhesive, applying adhesive to the box-engaging faces of said tabs, applying adhesive to the box-engaging face of the wrapper, and, before material setting of the adhesive coating of the wrapper, simultaneously applying the coated tabbed wrapper to a plurality of separate, unattached wall-forming components while holding them in box-forming position.

7. The method of forming a box, which comprises, in any sequence, the steps of applying tabs to a corner-cut wrapper with adhesive, applying adhesive to the box-engaging faces of said tabs, applying adhesive to the box-engaging face of the wrapper, and, before material setting of any of the adhesive coatings, applying the coated tabbed wrapper to a plurality of separate, unattached box-forming components while holding them in box-forming position, with the corner-laps at the ends of the wrapper side panels overlying the respective end walls of the box.

8. The method of forming a box having a plurality of side walls and a bottom, which comprises the steps of applying adhesive to a wrapper, and thereafter, in either sequence, applying tabs to the coated wrapper and coating the box-engaging face of said tabs with adhesive, and, before material setting of any of the adhesive coatings, simultaneously applying the coated tabbed wrapper to a plurality of separate, unattached wall-forming components while holding them in box-forming position.

9. The method of forming a box, which comprises the steps of applying adhesive to a corner-cut wrapper, applying tabs to the coated wrappers, applying adhesive to the

box-engaging faces of said tabs, and, before material setting of any of the adhesive coatings, applying the coated tabbed wrapper to a plurality of separate, unattached box-forming components while holding them in box-forming position with the corner-laps at the ends of the wrapper side panels overlying the respective end walls of the box.

10. The method of forming boxes, which comprises transporting individual wrappers in succession to a wrapping station, transporting to said station in succession individual groups of separate, unattached box-forming components, and at said station applying individual wrappers to individual groups of said components.

11. The method of forming boxes, which comprises transporting individual wrappers in succession to a wrapping station, transporting individual groups of separate, unattached box-forming components to said station, and in succession applying an individual wrapper to an individual group of box-forming components.

12. The method of forming boxes, which comprises transporting individual wrappers in succession to a wrapping station, transporting to said station in succession individual groups of separate, unattached box-forming components held in box-forming position, and at said station in succession applying an individual wrapper to an individual group of box-forming components.

13. The method of forming boxes, which comprises transporting in succession to a wrapping station individual wrappers, each having on one face a fluid adhesive coating, transporting to said station in succession individual groups of separate unattached box-forming components held in box-forming position, and at said station applying individual wrappers to individual groups of said components while the adhesive coating on said wrappers is still fluid.

14. The method of forming boxes, which comprises assembling groups of separate, unattached box-forming components with the components of each group held in box-forming position, co-incidentally transporting in succession to a wrapping station individual wrappers having on one face a fluid adhesive coating and individual groups of said box-forming components, and at said station applying individual wrappers to individual groups of said components while the adhesive coating on said wrappers is still fluid.

15. The method of forming boxes, which comprises assembling groups of separate, unattached box-forming components with the components of each group held in box-forming position, co-incidentally transporting in superposed relation and in succession to a wrapping station individual wrappers having on one face a fluid adhesive coating and individual groups of said box-forming components, and at said station applying individual wrappers to individual groups of said components while the adhesive coating on said wrappers is still fluid.

16. The method of forming boxes, which comprises transporting individual tabbed wrappers in succession to a wrapping station, transporting individual groups of separate, unattached box-forming components to said station, and in succession applying an individual wrapper to an individual group of box-forming components with the tabs overlying corners of the box.

17. The method of forming boxes, which comprises transporting in succession to a wrapping station individual tabbed wrappers, said tabbed wrappers having on one face a fluid adhesive coating, transporting to said station in succession individual groups of separate box-forming components held in box-forming position, and at said station, while the adhesive coating on said wrapper is still fluid, applying individual wrappers to individual groups of said components with the tabs overlying corners of the box.

18. Box-wrapping mechanism comprising means for transporting in succession individual wrappers having on one face a fluid adhesive coating, means for applying a plurality of tabs thereto, and means for applying a tabbed individual wrapper, while its adhesive coating is still fluid, to a plurality of separate, unattached box-forming components to hold them in box-forming position with the tabs overlying corners of the box.

19. Box-wrapping mechanism comprising means for transporting individual corner-cut wrappers in succession, means operating in timed relation thereto for assembling a plurality of unattached box-forming components, and means for applying an individual wrapper to said components to hold them in box-forming position.

20. Box-wrapping mechanism comprising means for transporting individual corner-cut wrappers in succession, means operating in timed relation thereto for assemblying a plurality of unattached box-forming components in box-forming position, and means operating in timed relation to said second means for applying an individual wrapper to said components to hold them in said position.

21. Box-wrapping mechanism comprising means for transporting individual wrappers in succession toward a wrapping station, means for transporting groups of unattached box-forming components in succession toward said station, and means at station for applying an individual wrapper to an individual group of said components to hold them in box-forming position.

22. Box-wrapping mechanism comprising

means for transporting individual wrappers in succession toward a wrapping station, means for transporting groups of unattached box-forming components assembled in box-forming position in succession toward said station, and means at station for applying an individual wrapper to an individual group of said components to hold them in box-forming position.

23. Box-wrapping mechanism comprising means for transporting in succession toward a wrapping station individual wrappers having on one face a fluid adhesive coating, means for transporting groups of unattached box-forming components in sucession toward said station, and means at said station comprising reciprocating form-block structure for applying an individual wrapper, while its adhesive coating is fluid, to an individual group of said components to hold them in box-forming position.

24. Box-wrapping mechanism comprising means for transporting in succession toward a wrapping station individual corner-cut wrappers having on one face a fluid adhesive coating securing a plurality of tabs thereto, means for transporting groups of separate box-forming components assembled in box-forming position toward said station, and means at said station for applying an individual wrapper, while its adhesive coating is fluid, to an individual group of said components to hold them in box-forming position with the corner-laps at the ends of the wrapper side panels overlying the respective end walls of the box.

25. The combination with the form-block structure of a wrapping machine, of means timed therewith for transporting individual wrappers in succession into the path of said form-block structure, means for transporting a plurality of separate, unattached box-forming components into said path, and means comprised in said wrapping machine for utilizing an individual wrapper to hold a group of said components in box-forming position.

26. The combination with the form-block structure of a wrapping machine, of means timed therewith for transporting individual wrappers in succession into the path of said form-block structure, means likewise timed with said wrapping machine for transporting in succession into said path groups of separate, unattached box-forming components assembled in box-forming position, and means comprised in said wrapping machine for applying an individual wrapper to a group of said components while held in said position.

27. The combination with the form-block structure of a wrapping machine, of means timed therewith for transporting into the path of said form-block structure in succession individual wrappers, means for applying a fluid adhesive coating to one face of said wrapper, means for transporting a plurality of separate, unattached box-forming components into said path, and means comprised in said wrapping machine for applying an individual wrapper, while its adhesive coating is still fluid, to a group of said components to hold them in box-forming position.

28. The combination with the form-block structure of a wrapping machine, of means timed therewith for transporting into the path of said form-block structure in succession individual wrappers having on one face a fluid adhesive coating, means for transporting a plurality of separate, unattached box-forming components into said path, and means comprised in said wrapping machine for applying an individual wrapper, while its adhesive coating is still fluid, to said components while held in box-forming position.

29. The combination with the form-block structure of a wrapping machine, of mechanism timed therewith for applying a fluid adhesive coating to individual wrappers in succession, means timed with said wrapping machine for transporting said wrappers in succession into the path of said form-block structure, means timed with said wrapping machine for transporting a plurality of separate, unattached box-forming components into said path, and means comprised in said wrapping machine for utilizing an individual wrapper, while its adhesive coating is still fluid, to hold a group of said components in box-forming position.

30. The combination with the form-block structure of a wrapping machine, of mechanism timed therewith for applying a fluid adhesive coating to individual wrappers in succession, means for applying a plurality of tabs to each wrapper, means timed with said wrapping machine for transporting the tabbed wrappers in succession into the path of said form-block structure, means timed with said wrapping machine for transporting a plurality of separate, unattached box-forming components into said path, and means comprised in said wrapping machine for utilizing an individual wrapper, while its adhesive coating is still fluid, to hold a group of said components in box-forming position with the tabs overlying corners of the box.

31. The combination with the form-block structure of a wrapping machine, of mechanism timed therewith for applying a fluid adhesive coating to individual wrappers in succession, means for applying a plurality of tabs to each wrapper after application thereto of said adhesive coating, means timed with said wrapping machine for transporting the tabbed wrappers in succession into the path of said form-block

structure, means timed with said wrapping machine for transporting a plurality of separate, unattached box-forming components into said path, and means comprised in said wrapping machine for utilizing an individual wrapper, while its adhesive coating is still fluid, to hold a group of said components in box-forming position with the tabs overlying corners of the box.

32. The combination with the form-block structure of a wrapping machine, of mechanism timed therewith for applying a fluid adhesive coating to individual wrappers in succession, means timed with said wrapping machine for transporting said wrappers in succession into the path of said form-block structure, means for applying a plurality of tabs to each wrapper while under the control of said transporting means, means timed with said wrapping-machine for transporting a plurality of separate, unattached box-forming components into said path, and means comprised in said wrapping machine for utilizing an individual wrapper, while its adhesive coating is still fluid, to hold a group of said components in box-forming position with the tabs overlying corners of the box.

33. The combination with the form-block structure of a wrapping machine, of means timed therewith for transporting a plurality of separate, unattached box-forming components into the path of said form-block structure, wrapper-coating mechanism timed with said wrapping machine for applying a fluid adhesive coating to individual wrappers in succession, wrapper-tabbing mechanism timed with said wrapping machine for applying a plurality of tabs to individual wrappers, mechanism for applying a fluid adhesive coating to the exposed tab surfaces, means timed with said wrapping machine for transporting the tabbed wrappers in succession into said path, and means comprised in said wrapping machine for applying an individual tabbed wrapper, while its adhesive coating is still fluid, to a group of said components with the tabs overlying corners of the box.

34. The method of forming a box, which comprises shaping a box-forming component to form opposite walls and the bottom of the box, bringing other box-forming components into registering, unattached relation with said bottom and walls to form the other opposite box walls, and thereafter applying a wrapper to said components to hold them in box-forming position.

35. The method of forming a box, which comprises shaping a box-forming component to form opposite walls and the bottom of the box, bringing other box-forming components into registering relation with said bottom and walls to form the other opposite box walls, and transporting the assembly while temporarily held in box-form to a wrapping machine.

36. Apparatus for producing a box comprising means for shaping a box-forming component to form opposite walls and the bottom of a box, pneumatic means for associating other box-forming components with said shaped component to form the other opposite box walls, and means to apply a wrapper permanently to hold said components in box-forming position.

37. Apparatus for producing a box comprising means for shaping a box-forming component to form opposite walls and the bottom of a box, means for associating other box-forming components with said shaped component to form the other opposite box walls, means temporarily to hold the assembly in box-form, and means for transporting the assembly while retained by said last named means to a wrapping station.

38. The combination with a wrapping machine and means for delivering into the path of the wrapping machine form-block structure individual wrappers having on one face a fluid adhesive coating, of means for shaping a box-forming component to form opposite walls and the bottom of a box, means for associating other box-forming components with said shaped component to form the other opposite box-walls, means temporarily to hold the assembly in box-form, and means for transporting the assembly while retained by said last named means into said path.

39. The combination with a wrapping machine and means timed therewith for delivering into the path of the wrapping machine form-block structure individual wrappers having on one face a fluid adhesive coating, of means timed with said wrapping machine for shaping a box-forming component to form opposite walls and the bottom of a box, means timed with the wrapping machine for associating other box-forming components with said shaped component to form the other opposite walls of the box, means temporarily to hold the assembly in box-form, and means timed with the wrapping machine for transporting the assembly while retained by said last named means into said path.

40. The combination with a wrapping machine and means for delivering into the path of the wrapping machine form-block structure individual wrappers having on one face a fluid adhesive coating, of a reciprocatory plunger for passing a box-forming component in one direction, means coacting with said plunger for shaping said component to form opposite walls and the bottom of a box, means for associating other box-forming components with said shaped component to form the other opposite walls of the box, means temporarily to hold the assembly in

box-form, and means for transporting the assembly while retained by said last named means into said path.

41. The combination with a wrapping machine, means for delivering into the path of the wrapping machine form-block structure individual wrappers having on one face a fluid adhesive coating, of a reciprocatory plunger for passing a box-forming component in one direction, means coacting with said plunger for shaping said component to form opposite walls and the bottom of a box, a plurality of spaced rollers, means for passing said shaped component between said rollers to impart a bias to said walls, means for associating other box-forming components with said shaped component, and means for transporting the assembled box-forming components into said path.

42. The combination with a wrapping machine and means for delivering into the path of the wrapping machine form-block structure individual wrappers having on one face a fluid adhesive coating, of means for shaping a box-forming component to form opposite walls and the bottom of a box upon movement thereof in one direction, a reciprocatory plunger, means for transporting the shaped component into the path of said plunger, means for securing other box-forming components to opposite walls of said plunger, means for moving said plunger toward and into said shaped box-forming component, and means receiving said box-forming components upon further movement of said plunger and retaining them in box-forming position, and means to move said components in box-forming position into the path of said form-block structure.

43. The combination with a wrapping machine and means for delivering into the path of the wrapping machine form-block structure individual wrappers having on one face a fluid adhesive coating, of means for shaping a box-forming component to form opposite walls and the bottom of a box upon movement thereof in one direction, a reciprocatory plunger, means for transporting the shaped component into the path of said plunger, means for securing other box-forming components to opposite walls of said plunger, means for moving said plunger toward and into said shaped box-forming component, means receiving said box-forming components upon further movement of said plunger and retaining them in box-forming position, and means for moving said last-named means into said path.

44. Box-wrapping mechanism comprising means for transporting in succession individual corner-cut wrappers having on one face a fluid adhesive coating, means for holding a plurality of separate, unattached box-forming components temporarily in box-forming position, and means for uniting said components so held by application thereto of an individual wrapper while the adhesive coating thereon is still fluid, the corner-laps at the ends of wrapper side panels overlying the respective end walls of the box.

45. The method of forming a box, which comprises temporarily holding a plurality of separate, unattached box-forming components in box-forming position, and thereafter applying tabs and an individual wrapper to said separate components, while adhesive coatings on said tabs and wrapper are simultaneously fluid.

46. Box-wrapping mechanism comprising form-block structure, means operating intermittently to deliver unattached box end components to said form block structure, means operating in timed relation to said first means for delivering box components each adapted to form a box bottom and side wall and wrappers aligned therewith to said form-block structure, and mechanism cooperating with said form-block for applying the wrappers to attach said components in box-forming position about said form-block structure.

47. Box-wrapping mechanism comprising form-block structure, means for retaining stacks of box end components, mechanism intermittently to deliver end components of said stacks to ends of said form-block structure, means operating in timed relation to said mechanism for delivering to said form-block structure box components each adapted to form a box bottom and side walls and aligned wrappers, and mechanism cooperating with said form-block structure for applying the wrappers in succession to components assembled about said form-block structure to attach them in box-forming position.

48. Box-forming mechanism comprising form-block structure, means for delivering unattached wall-forming components and a box-bottom detached from at least one of said components to said form-block structure, means temporarily to hold said components and the box-bottom in box-forming relation upon said form-block, and mechanism for adhesively applying sheet-material to hold said box-components and box-bottom permanently in box-forming position.

49. The method of forming a box from separate, unattached box-forming walls and a box-bottom, which comprises temporarily holding the side and end walls and box-bottom in box-forming relation, and while so held applying sheet material adhesively to engage the neighboring walls and bottom and to embrace the corners formed by their adjacent edges for holding the walls and

bottom permanently in box-forming position.

50. The method of forming a box from separate, unattached box-forming wall elements and a box-bottom, which comprises providing stacks of said wall elements, periodically bringing wall elements from said stacks to predetermined position and there temporarily holding the side and end wall elements and the box-bottom in box-forming position, and while so held, adhesively applying sheet material to engage the neighboring walls and bottom and to embrace the corners formed by their adjacent edges for holding the walls and bottom permanently in box-forming position.

51. Box-forming mechanism comprising form-block structure, means operating intermittently to deliver unattached box-wall components to said form-block structure, means operating in timed relation to said first means for feeding a box-bottom and adhesively coated sheet material to said form-block structure, and means cooperating with said form-block structure to apply said sheet material adhesively to engage the neighboring walls and bottom and to embrace the corners formed by their adjacent edges for holding the walls and bottom permanently in box-forming position.

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