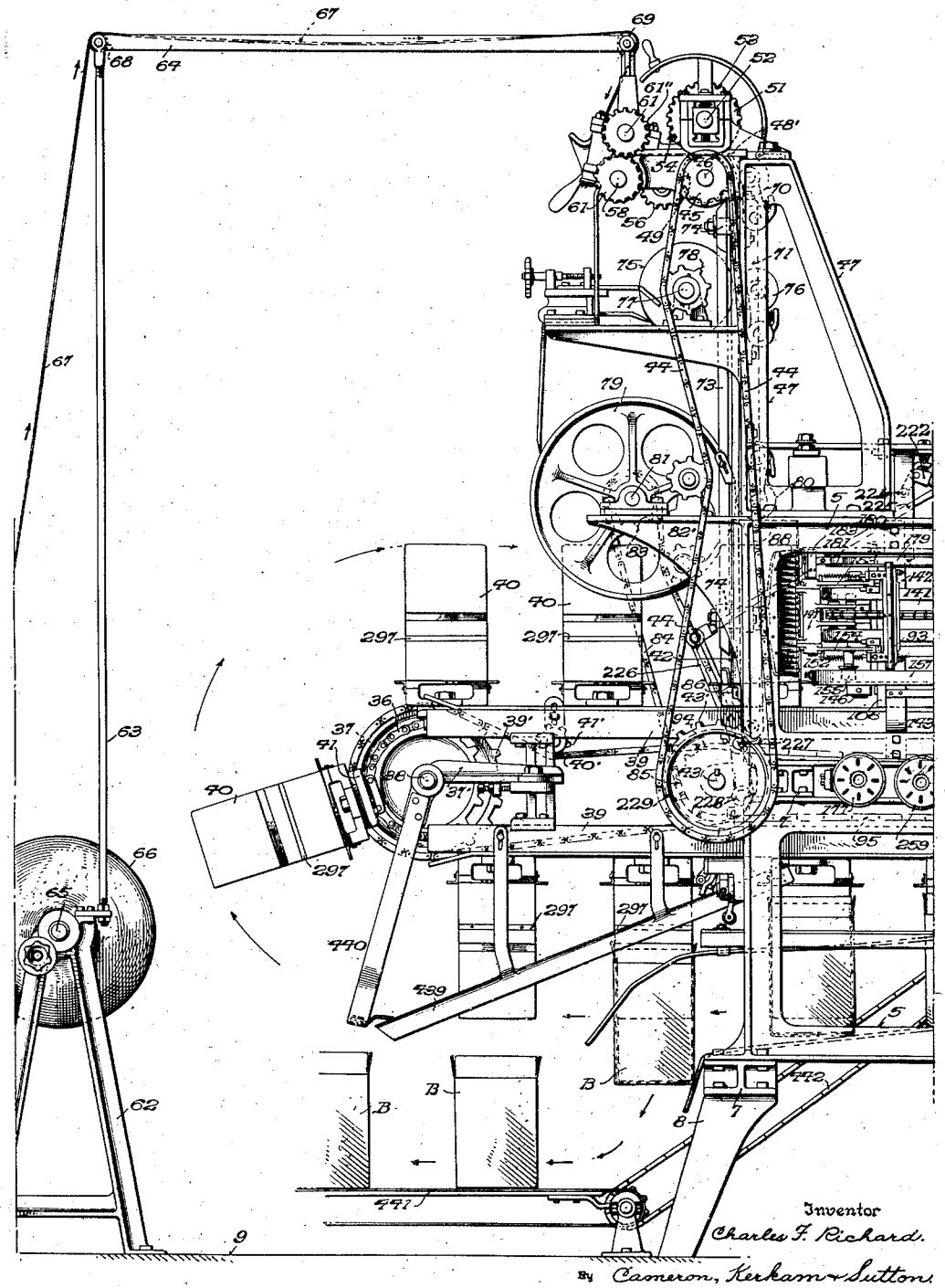
April 10, 1934. C. F. RICHARD 1,954,428

CARTON MAKING MACHINE

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Fig. 1.



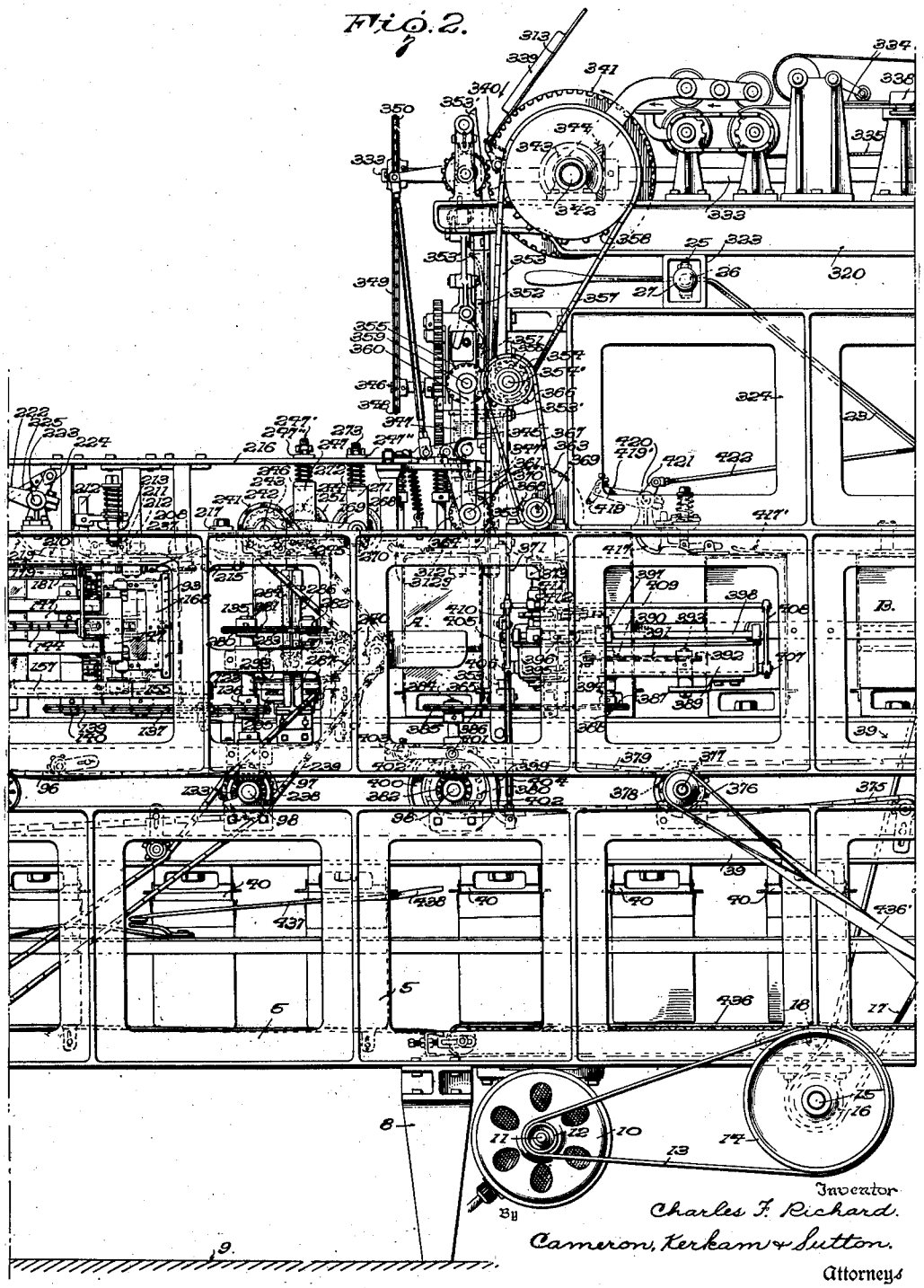
Inventor
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CARTON MAKING MACHINE

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Fig. 2.



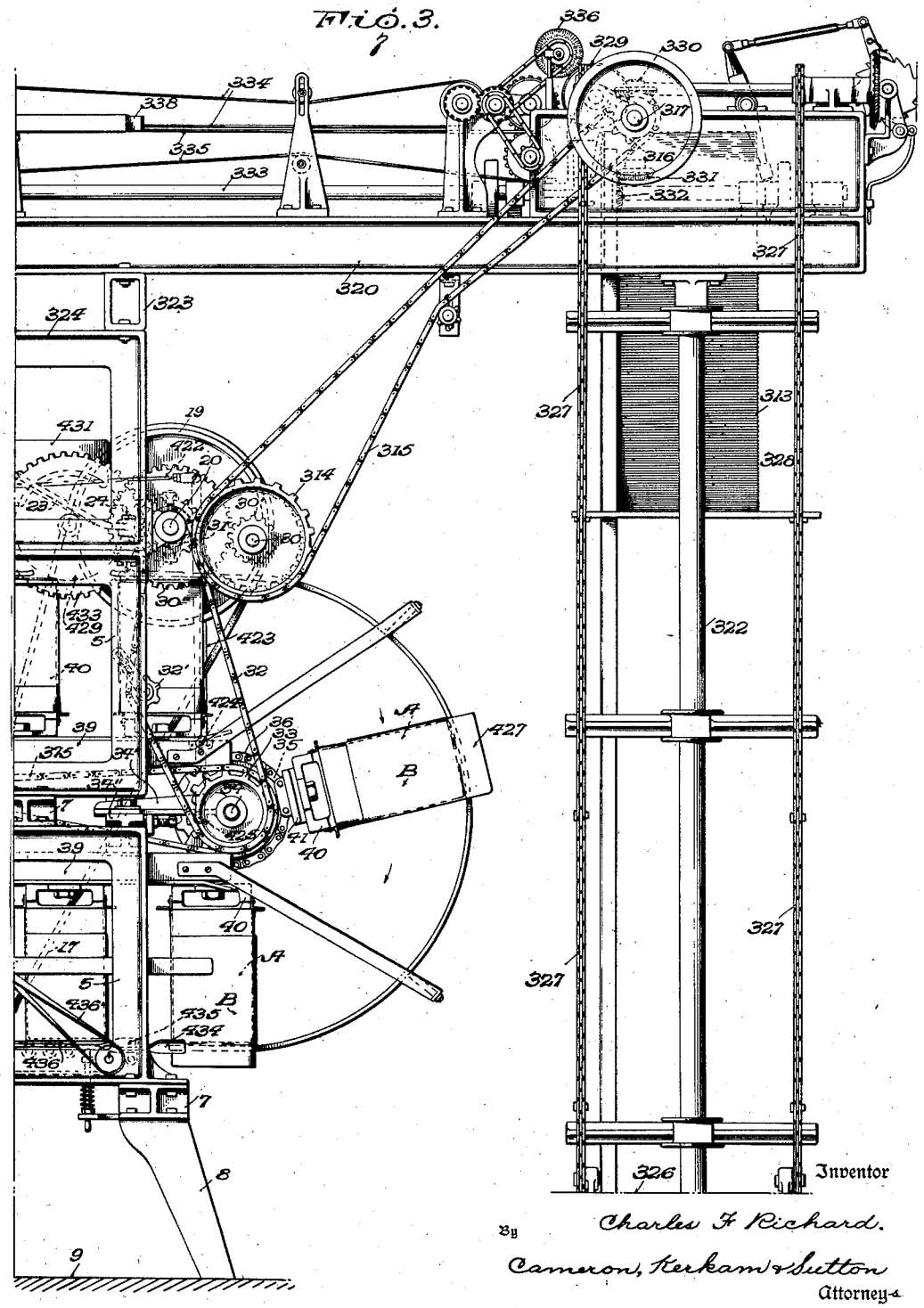
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CARTON MAKING MACHINE

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FIG. 3.



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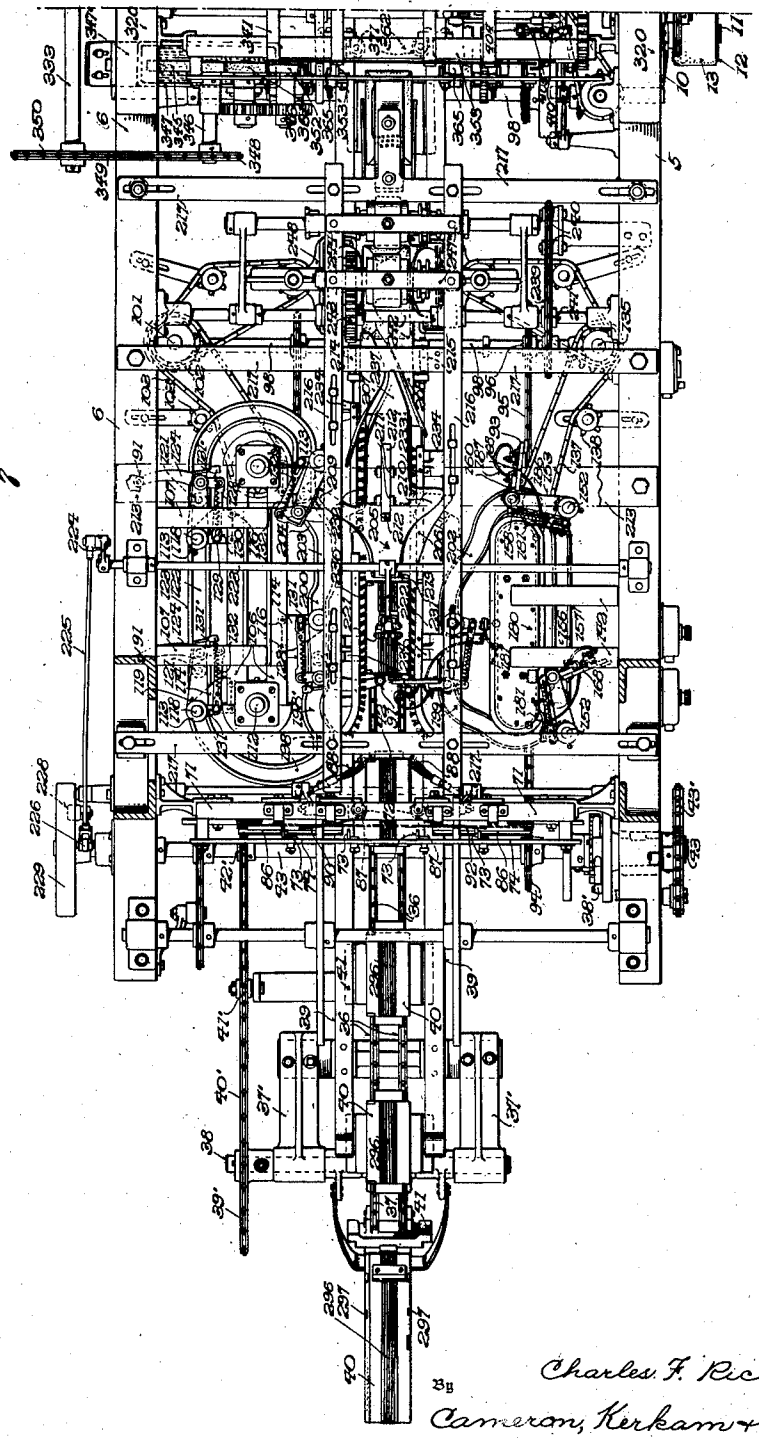
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CARTON MAKING MACHINE

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Fig. 4



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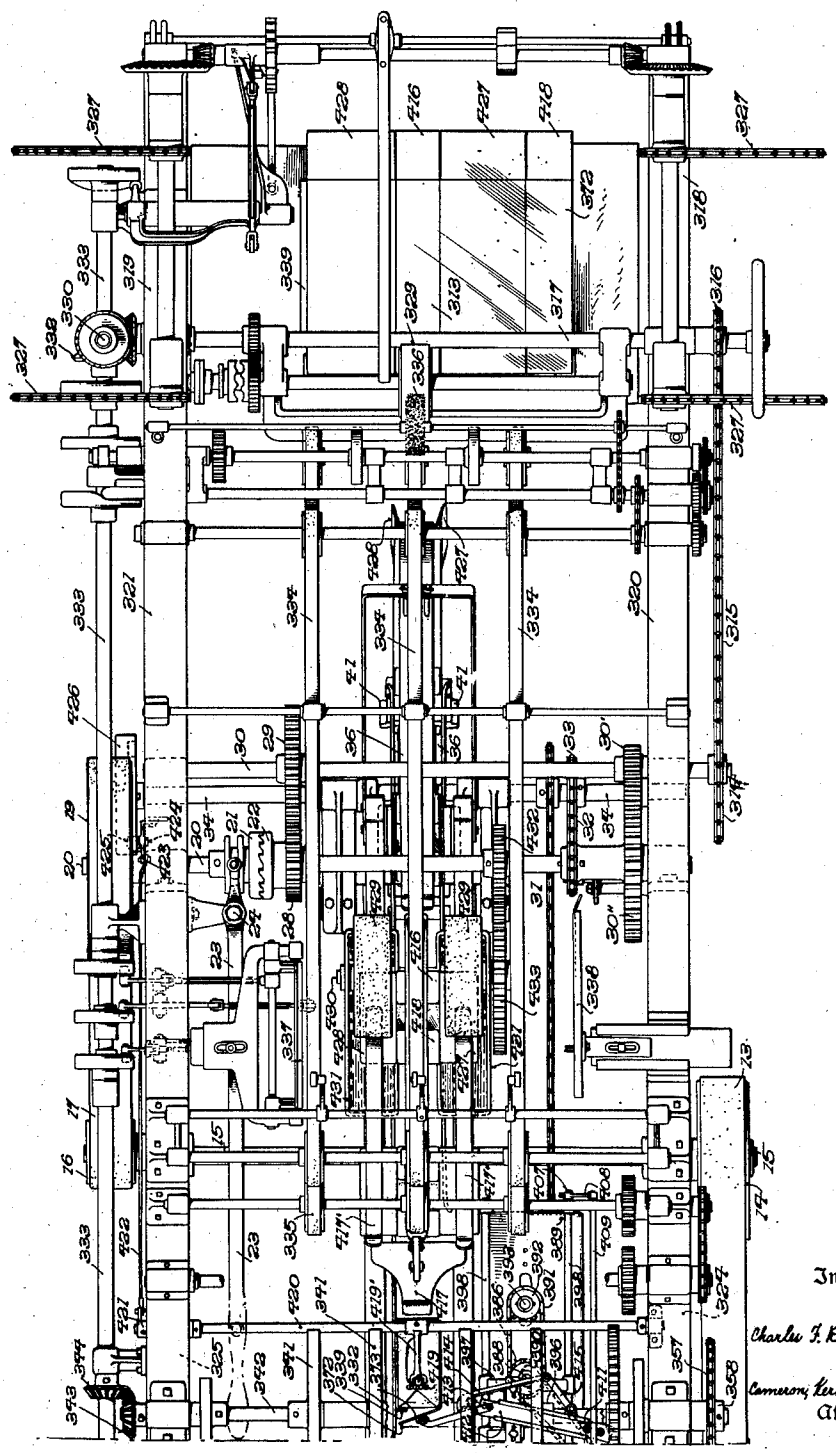


Fig. 5.

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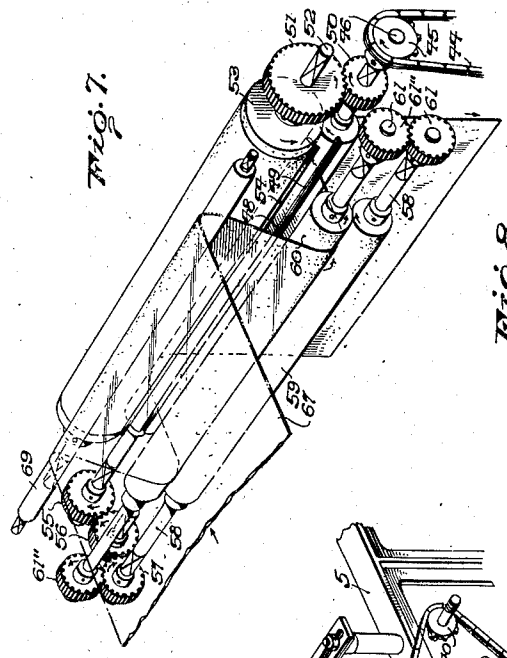


Fig. 7.

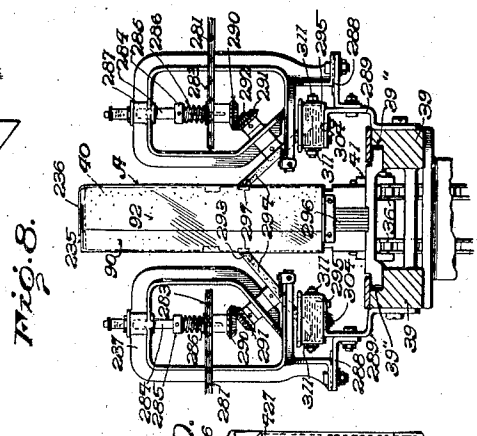


Fig. 8.

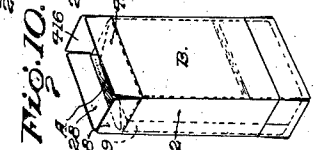


Fig. 10.

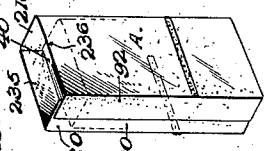


Fig. 9.

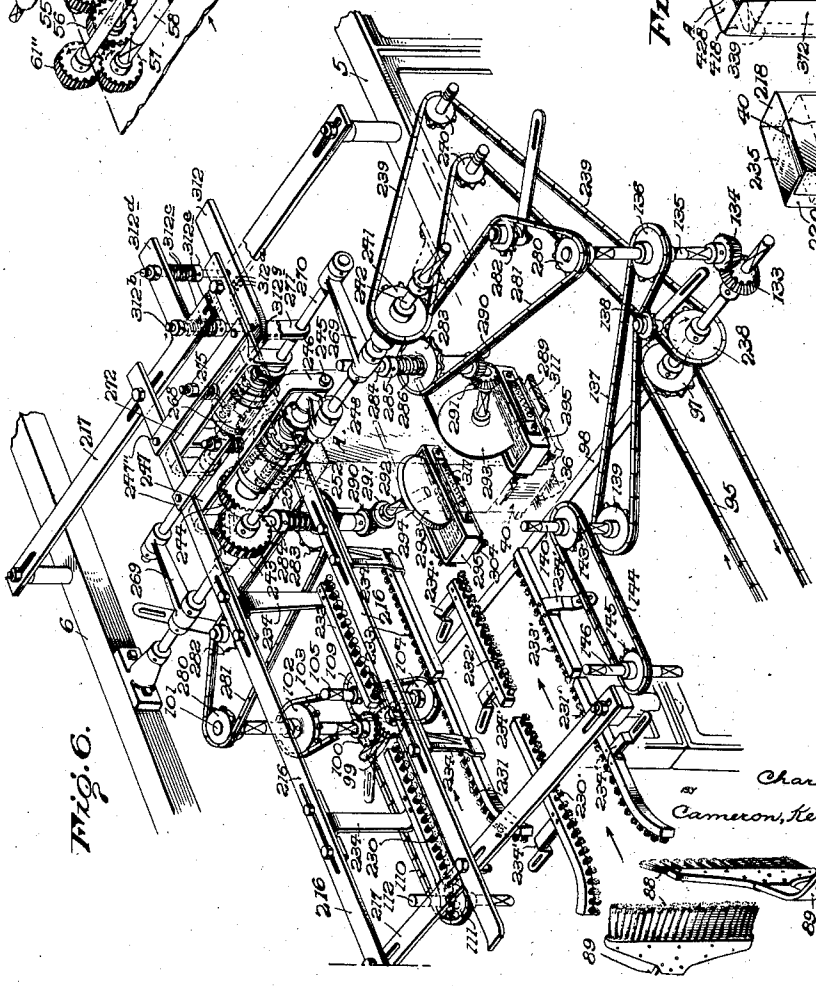


Fig. 6.

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CARTON MAKING MACHINE

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Fig. 13.

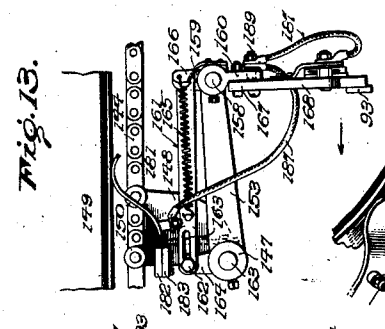


Fig. 14.

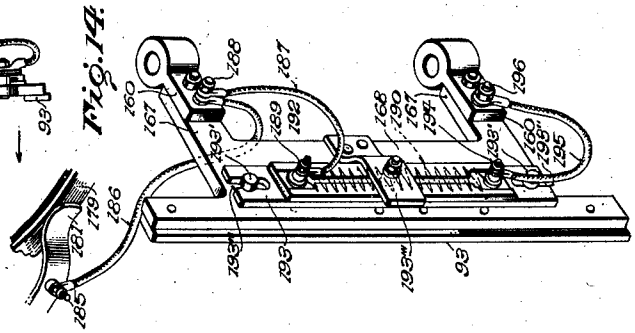


Fig. 12.

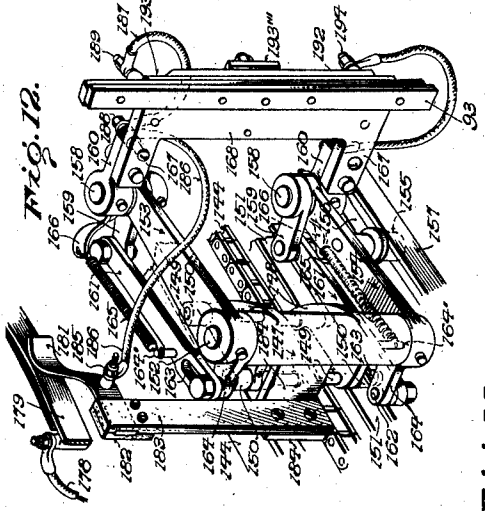


Fig. 15.

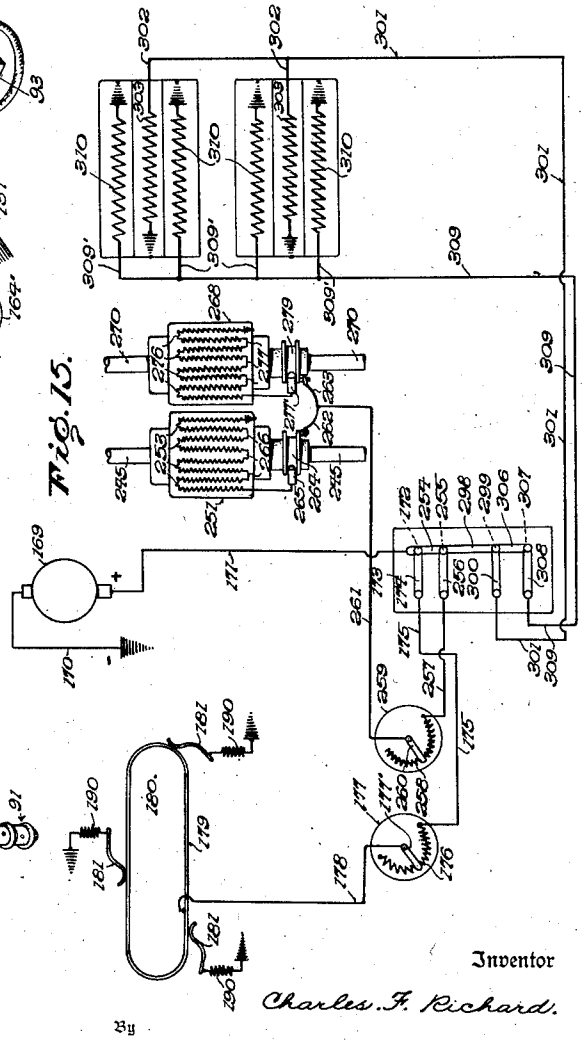
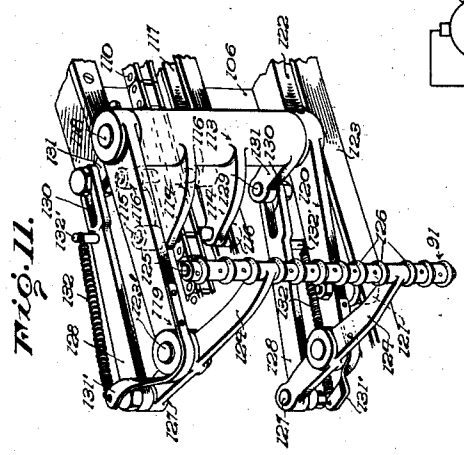


Fig. 11.



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Patented Apr. 10, 1934 1,954,428

UNITED STATES PATENT OFFICE

1,954,428

CARTON MAKING MACHINE

Charles F. Richard, Battle Creek, Mich., assignor to Johnson Automatic Sealer Co., Ltd., Battle Creek, Mich., a limited partnership association

Application February 4, 1931, Serial No. 513,401

35 Claims. (Cl. 93—44)

This invention relates to carton making machines, and while capable of general use, is particularly adapted for making lined cartons.

One object of the present invention is to provide an improved machine which lines cartons with waxed paper or the like and operates continuously at high speed to produce the lined cartons with great rapidity.

Another object of the present invention is to provide an improved machine which lines cartons with waxed paper and secures the waxed paper liners to the carton through the application of a substance that will cause the waxed paper to adhere to the cartons.

Another object of the present invention is to provide a machine which forms waxed paper liners or containers and embodies movable means for folding the liners and heat sealing the same through the medium of the wax with which the liners are coated or impregnated.

Another object of the present invention is to provide a machine which forms waxed paper liners or containers and embodies one or more continuously traveling heated devices that fold the liners or containers and heat seal overlapping portions thereof.

Another object of the present invention is to provide a machine which forms waxed paper liners or bags and embodies movable heated devices operated to fold in and heat seal side and end portions of said liners or bags.

Another object of the present invention is to provide a machine which forms waxed paper bags or containers and embodies improved folding means, and a positively driven heated roller or the like for heat sealing closed ends of said bags or containers.

Another object of the present invention is to provide a machine which forms waxed paper liners or containers and embodies novel brushes for holding blanks in place while the liners or containers are being formed therefrom.

Another object of the present invention is to provide a machine which forms liners or containers and embodies novelly arranged and constructed devices for end folding portions of said liners or containers.

Another object of the present invention is to provide a machine which forms a carton with a waxed paper liner therein and secures said elements together through the application of heated wax to one of the same.

Another object of the present invention is to provide a machine which forms waxed paper containers and embodies novel means for applying heated wax or the like on said containers to secure them in other containers.

Another object of the present invention is to provide a machine which forms containers and embodies novel folding and sealing devices and novel means for heating the same.

Another object of the present invention is to provide a machine which embodies novel folding and sealing devices traveling and operated continuously to form containers and heated during movement of the same so as to heat seal said containers.

These and other objects of the present invention will appear as the following description thereof proceeds, and in order to more clearly understand said invention reference may be had to the accompanying drawings which illustrate one embodiment thereof.

In said drawings:

Figs. 1, 2 and 3 are complementary side elevations of a carton making machine embodying the present invention;

Figs. 4 and 5 are complementary top plan views, with parts omitted and other parts in section, of the machine shown in Figs. 1, 2 and 3;

Fig. 6 is a detail perspective view of liner engaging brushes and means for driving liner folding devices and liner sealing and wax applying rollers;

Fig. 7 is a detail perspective view of portions of a liner cutting and feeding mechanism shown in Fig. 1;

Fig. 8 is an end view of a form carrying a liner, showing devices located at opposite sides of the path of travel of the form and adapted to apply stripes of heated wax on opposite sides of said liner;

Fig. 9 is a detail perspective view of a liner or bag;

Fig. 10 is a detail perspective view of a lined carton;

Figs. 11 and 12 are enlarged detail perspective views of a "cold" folder and a "hot" folder, respectively, shown in Fig. 4;

Fig. 13 is a fragmentary top plan view of the folder shown in Fig. 12;

Fig. 14 is a fragmentary detail perspective view of parts of the folder illustrated in Figs. 12 and 13, showing means for heating said folder; and

Fig. 15 is a diagrammatic view of an electric circuit including means for heating folding devices, heat sealing rollers, and wax containers shown in preceding figures.

Referring to the drawings, wherein like reference characters designate like parts throughout

the several views, 5 and 6 indicate the side frames of the machine, which are connected together by cross members 7 and have legs 8 that are bolted or otherwise suitably secured on the machine foundation 9. The various movable parts of the machine are mounted on the above described framework and said parts are preferably driven from a common source of power, herein shown as an electric motor 10 which is bolted or otherwise suitably secured on the side frame 5 at the bottom thereof. This motor 10 is supplied with current from any suitable source, and said motor may be stopped or started, as desired, by a suitable switch (not shown).

Fixed on the armature shaft 11 of the motor 10 is a pulley 12 around which passes a belt 13. The belt 13 also passes around a pulley 14 which is fixed on one end of a shaft 15 that extends transversely of the machine and is journalled in suitable bearings on the side frames 5 and 6 thereof. Fixed on the opposite end of the shaft 15 is a pulley 16 around which passes a belt 17 the tension of which is regulated, as desired, by a tension roller 18 mounted on the side frame 6 of the machine in any suitable manner. The belt 17 also passes around a pulley 19 that is fixed on a shaft 20 extending across the machine at the top and rear thereof and journalled in suitable bearings on the side frames 5 and 6. This shaft 20 constitutes the main drive shaft of the machine, and said shaft is continuously driven through the described driving connections therefor with the motor 10.

Mounted on the shaft 20 is a clutch of any suitable type including a part 21 which is splined on said shaft to rotate therewith and move therealong, and a part 22 which is loosely mounted on said shaft and rotated thereon upon engagement of the clutch parts 21 and 22. The clutch part 21 is moved into and out of engagement with the clutch part 22 by a lever 23 which is pivoted at 24 on the framework of the machine. The lever 23 is pivotally connected at 25 with a rod 26 extending transversely of the machine through suitable bearings on the side frames 5 and 6 thereof. This rod 26 is provided at its opposite ends with knobs or handles 27 by means of which the rod may be moved to swing the lever and engage the clutch part 21 with, and disengage said part from, the clutch part 22.

The clutch part 22 has secured to, or formed integrally therewith, a pinion 28 which meshes with a gear 29 that is fixed on a shaft 30 extending transversely of the machine and journalled in suitable bearings on the side frames 5 and 6. This shaft 30 also has fixed thereon a pinion 30' which meshes with a gear 30'' loosely mounted on the shaft 20. The gear 30'' has secured thereto, or formed integrally therewith, a sprocket 31 around which passes a chain 32 that also passes around an idler sprocket 32' journalled and adjustably mounted in any suitable manner on the side frame 5. The chain 32 also passes around a sprocket 33 which is fixed on a shaft 34 extending transversely of the machine at the rear thereof and journalled in suitable bearings provided by brackets 34' bolted or otherwise suitably secured on a spacer 34'' between conveyor ways 39. The shaft 34 also has fixed thereon sprockets 35 around which pass chains 36 which extend longitudinally of the machine between the side frames 5 and 6 and pass around sprockets 37.

The sprockets 37 are fixed on a shaft 38 which extends transversely of the machine and is journalled in suitable bearings provided by brackets 37' bolted or otherwise suitably secured on the front ends of the ways 39. The ways 39 project forwardly from the frames 5 and 6 and extend longitudinally of the machine between said frames. These ways 39 are bolted or otherwise suitably secured to certain of the cross members 7 which extend between said ways. The chains 36 and a plurality of carton forms 40 carried thereby, are thus driven continuously from the shaft 20 when the clutch parts 21 and 22 are connected by the described means for this purpose. The forms 40 are secured to, or have formed integrally therewith, base plates 41 which are fastened to the chains 36 in any suitable manner at intervals along the same. During travel of the chains 36 and the forms 40, the base plates 41 of the latter are received in suitable guides 39'' on the ways 39 and which serve to guide the forms and maintain them in proper position.

In accordance with the present invention, blanks 42 (Figs. 1 and 4) are fed into the path of travel of the forms or supports 40 and formed into containers thereon by mechanism including movable means for folding and heat sealing said blanks. These blanks may be of paper or other suitable material impregnated with, or having applied thereto, a substance which upon application of heat to overlapping portions thereof, will be effectively sealed through the medium of said substance. As herein shown, blanks 42 of waxed paper are employed in the making of bags or liners A (Fig. 9) that are formed on the supports or forms 40, and said blanks are fed into the path of travel of said forms by mechanism such as disclosed in Patent No. 1,674,920, granted June 26, 1928, to G. A. Robinson.

Accordingly, the shaft 38 has mounted thereon, a sprocket 39' around which passes a chain 40' that passes under an idler sprocket 41' which serves to regulate the tension on said chain and is journalled and adjustably mounted in any suitable manner on the side frame 6. The chain 40' also passes around a sprocket 42' which is fixed on a shaft 43 extending transversely of the machine and journalled in suitable bearings on the side frames 5 and 6. Loosely mounted on the shaft 43, and driven from said shaft through a suitable clutch 38' (Fig. 4) thereon, is a sprocket 43' around which passes a chain 44. This chain 44 also passes around a sprocket 45 which is fixed on a shaft 46 extending transversely of the machine and journalled in suitable bearings on brackets 47 that are bolted or otherwise suitably secured to the side frames 5 and 6 at the top thereof (Fig. 1). This shaft 46 has fixed thereon a roller 48 provided longitudinally thereof on its circumference with a groove 49 (Fig. 7). The shaft 46 also has fixed thereon a pinion 50 which meshes with a gear 51 that is fixed on a shaft 52 extending transversely of the machine and journalled in suitable bearings on the brackets 47.

Fixed on the shaft 52 is a roller 53 provided longitudinally thereof on its periphery with a cutter 54 which enters the groove 49 of roller 48 during each revolution of the latter and the roller 53. Fixed on the shaft 46 at the end thereof opposite that carrying the pinion 50, is a gear 55 which meshes with an idler gear 56 that is journalled on one of the brackets 47. This idler gear 56, in turn, meshes with a gear 57 that is fixed on a shaft 58 extending transversely of the machine and journalled in suitable bearings on the

brackets 47. Fixed on the shaft 58 is a lower feed roller 59 which cooperates with an upper feed roller 60 that is fixed on a shaft 61 extending transversely of the machine and journalled in suitable bearings on the brackets 47. This upper feed roller 60 is driven by gears 57, 61' fixed on shaft 58 and meshing with gears 61'' fixed on shaft 61. The upper feed roller 60, the lower feed roller 59, the roller 53 and cutter 54 thereon, and the roller 48 are thus driven continuously through the described driving connections therefor with the shaft 38.

Bolted or otherwise suitably secured to the machine foundation 9, are frames 62 (Fig. 1) that carry vertically extending supports 63 the lower ends of which are bolted or otherwise suitably secured to said frames. The upper ends of the supports 63 are secured in any suitable manner to corresponding ends of horizontally extending supports 64 the opposite ends of which are secured in any suitable manner to the brackets 47. Journalled in suitable bearings on the frames 62 is a shaft 65 on which is mounted a roll 66 of waxed paper. A web 67 from this roll is led upwardly around a roller 68 on the supports 63, then horizontally around a roller 69 on the supports 64, and then downwardly and horizontally between the feed rollers 59 and 60 from which the web is led horizontally between the rollers 48 and 53. The web is then guided downwardly by guides 48', between the roller 48 and pressure rollers 70 cooperating therewith, said pressure rollers being mounted in any suitable manner on a vertically extending plate 71 which carries said guides.

The plate 71 is bolted or otherwise suitably secured to the side frames 5 and 6 and the brackets 47, and said plate is provided near the bottom thereof with an opening 72 through which the forms 40 pass in their travel along a closed or endless path with the chains 36. The forms 40 also pass between the innermost pair of a plurality of vertically extending guides 73 disposed rearwardly of the plate 71 in closely spaced relation therewith and bolted or otherwise suitably secured in cross members 74 which, in turn, are bolted or otherwise suitably secured on the plate 71 (Figs. 1 and 4).

As the web 67 passes between the rollers 48 and 70, said web is directed downwardly between the plate 71 and the guides 73, whereupon the cutter 54 cuts a blank 42 from said web at the time the leading edge of the web is seized between low speed rollers 75 and pressure rollers 76 cooperating therewith. The low speed rollers 75 are fixed on a shaft 77 extending transversely of the machine and journalled in suitable bearings on the brackets 47, said rollers and said shaft being driven by a sprocket 78 fixed on the latter and over which the chain 44 passes. The pressure rollers 76 are mounted on the plate 71 in any suitable manner and extend through suitable openings in said plate for engagement with the blank 42 and the low speed rollers 75.

The blank 42 is fed downwardly by the low speed rollers 75 and the pressure rollers 76, between high speed rollers 79 and pressure rollers 80, said high speed rollers being fixed on a shaft 81 journalled in suitable bearings on brackets 82 that are bolted or otherwise suitably secured to the side frames 5 and 6 at the top and corresponding end portions thereof. The high speed rollers are driven through the medium of a sprocket 83 fixed on the shaft 81 and around which passes a chain 84 that also passes around a sprocket 85 which is fixed on the shaft 43. The pressure rollers 80 are mounted in any suitable manner on the plate 71 and extend through suitable openings therein for engagement with the blank 42 and the high speed rollers 79.

The blanks 42, cut one after another by the described means for this purpose, are delivered in like manner by the high speed rollers 79 and the pressure rollers 80 downwardly in front of the continuously moving forms 40, the timing of the mechanisms being such that a blank 42 is delivered in front of each form 40 across the opening 72 and onto supports or stops 86, just before the form passes through said opening. The supports or stops 86 are arranged at opposite sides of the opening 72 and said supports or stops are bolted or otherwise suitably secured on the plate 71 near the bottom thereof.

As each form 40 moves through the opening 72 in plate 71, the blank 42 in front of said form is forced thereby through said opening and folded around the front and opposite sides of the form by rollers 87 extending vertically at opposite sides of the opening 72 and journalled in any suitable manner on the plate 71 (Fig. 4). Brushes 88 between which the form passes, then engage opposite sides of the blank and hold it against the form until folding mechanism, to be presently described, folds and seals the blank on the back of the form. The brushes 88 are carried by holders 89 that are mounted in any suitable manner on the plate 71 (Fig. 6).

In accordance with the present invention, the waxed paper blank 42 is made into a liner or container on the form 40, by means including movable devices that both fold and heat seal said liner or container. As herein shown, the panels 90 of the containers A are folded around the forms 40 by "cold" folders 91, and the panels 92 of said containers are folded around said forms by "hot" folders 93, said folders moving continuously in closed paths in timed relation with the continuously moving forms 40, and the folders 93 acting to heat seal overlapping portions of the panels 90 and 92 so that each liner or container A is sealed along one side thereof through the medium of the wax with which the container forming blank is coated or impregnated. The folders 91 are preferably operated, mounted, and constructed as follows.

Fixed on the shaft 43 is a sprocket 94 around which passes a chain 95 engaged by an idler 96 which serves to maintain proper tension on said chain and is mounted on the machine framework in any suitable manner. The chain 95 also passes around a sprocket 97 which is fixed on a shaft 98 extending transversely of the machine between the ways 39 and journalled in suitable bearings on the side frames 5 and 6. The shaft 98 is thus driven continuously through the described driving connections therefor with the shaft 43. Fixed on the shaft 98 adjacent one end thereof is a bevel gear 99 which meshes with a similar gear 100 that is fixed on a vertical shaft 101 adjacent the lower end thereof (Figs. 4 and 6). The shaft 101 is journalled in suitable bearings on the side frame 6, and fixed on said shaft is a sprocket 102 around which passes a chain 103 engaged by an idler sprocket 103' mounted on the side frame 6 in any suitable manner and serving to maintain proper tension on said chain. The chain 103 also passes around a sprocket 104 that is fixed on a shaft 105 extending vertically between ways 106 and journalled thereon in any suitable manner. The ways 106, in turn, are secured by any suit-

able means on upper and lower brackets 107 and 108 respectively which are bolted or otherwise suitably secured on the side frame 6 (Figs. 1, 2 and 4).

Fixed on the shaft 105 is a sprocket 109 around which passes a chain 110 that also passes around a sprocket 111. The sprocket 111 is fixed on a shaft 112 which extends vertically between the ways 106 and is journalled thereon in any suitable manner. The "cold" folders 91, herein shown as four in number, are secured to the chain 110 at intervals along the same, and said folders and said chain are driven continuously in a closed or endless path by the described driving connections for the chain with the continuously driven shaft 98. The folders 91 are identical as respects mounting, construction, and operation, and it is therefore only necessary to describe one of said folders. Each folder includes a vertical tubular boss 113 (Fig. 11) having secured thereto or formed integrally therewith spaced parallel plates 114 extending over the chain 110 and secured thereto as by pins 115 which pass through certain of the links of said chain. Journalled on the pins 115 and retained against displacement therefrom in any suitable manner, are rollers 116 which travel in suitable guides 117 formed on the ways 106 at the tops and bottoms thereof, respectively.

Journalled in the boss 113 is a shaft 118 having arms 119 and 120 fixed on the upper and lower ends thereof, respectively. The arm 120 has journalled thereon in any suitable manner, a roller 121 which extends in the groove 122 of a cam 123 made in the form of an elongated plate of irregular configuration and secured in any suitable manner to the brackets 108 below, and in spaced relation with, the ways 106. Pivoted at 123' on the arms 119 and 120, are folder arms 124 on corresponding ends of which are mounted the folder 91. As herein shown, the folder proper is comprised by a small vertically extending shaft 125 mounted on the folder arms 124 and carrying ribbed rollers or the like indicated at 126. Shaft 125 and the rollers 126 are retained against displacement from the folder arms 124 by any suitable means for this purpose, and said folder arms have pivotally connected therewith, as at 127, corresponding ends of links 128 the opposite ends of which have pin and slot connections 129 and 130, with arms 131 that are secured to or formed integrally with the boss 113. The arms 119 and 120 have secured thereto, as by clips 131', corresponding ends of springs 132 the opposite ends of which are secured, as by pins 132', on the links 128 adjacent the slots 130 therein. During travel of the chain 110 and the folders 91, the latter are operated, through engagement of the roller 121 with the cam 122, to fold the panels 90 of the blanks 42 on the forms 40, as before pointed out. The links 128 and the springs 132 normally maintain the folders at right angles to the arms 119 and 120, but provide for yielding movement of said folders to insure engagement of the same with the forms 40 and prevent damage to the folders.

The folders 93, as previously pointed out, fold the panels 92 of the blanks 42 on the forms 40, and said folders are preferably operated, mounted, and constructed as follows: Fixed on the continuously driven shaft 98 at the end opposite that carrying the bevel gear 99, is a bevel gear 133 which meshes with a similar gear 134 that is fixed on a vertical shaft 135 adjacent the lower end thereof (Figs. 2, 4 and 6). This shaft 135 is journalled in suitable bearings on the side frame 5, and said shaft has fixed thereon a sprocket 136 around which passes a chain 137. An idler sprocket 138 engaging the chain 137 serves to maintain proper tension thereon, and said idler sprocket is journalled in any suitable manner on the side frame 5 of the machine. The chain 137 also passes around a sprocket 139 that is fixed on a vertical shaft 140 extending between ways 141 and journalled thereon in any suitable manner. The ways 141 are secured in any suitable manner to upper and lower brackets 142 and 143 respectively, which, in turn, are bolted or otherwise suitably secured to the side frame 5 of the machine (Figs. 1, 2 and 4).

Fixed on the shaft 140 is a sprocket 143' around which passes a chain 144 that also passes around a sprocket 145. This sprocket 145 is fixed on a shaft 146 which extends vertically between the ways 141 and is journalled thereon in any suitable manner. The folders 93, herein shown as three in number, are secured to the chain 144 at equal intervals along the same, and said folders and said chain are driven continuously in a closed or endless path through the described driving connections for the chain with the continuously driven shaft 98. The folders 93, as respects their mounting, construction, and operation, are identical and it is therefore only necessary to describe one of the same.

Each folder 93 is carried by a vertically extending tubular boss 147 which has secured thereto, or formed integrally therewith, spaced plates 148 that are engaged over the chain 144 and secured thereto, as by pins 149 which extend through certain of the links of said chain (Figs. 12, 13 and 14). Journalled on the pins 149, and retained against displacement therefrom by any suitable means for this purpose, are rollers 150 which travel in suitable guides 151 on the ways 141. Rotatably mounted in the tubular boss 147 is a shaft 152 having fixed on the upper and lower ends thereof arms 153 and 154, respectively. The arm 154 has journalled thereon a roller 155 which extends in the groove 156 of a cam 157 comprised by an elongated plate of irregular configuration (Fig. 4). This cam 157 is secured in any suitable manner on the brackets 143 below the ways 141 and in spaced relation therewith.

Journalled in suitable openings in the arms 153 and 154 are pins 158 which project through said openings from opposite sides of said arms and have arms 159 and 160 that are rigidly secured on the pins 158 in alinement and turn therewith on the arms 153 and 154, respectively. The arms 160 have pivotally connected therewith corresponding ends of links 161 the opposite ends of which have pin and slot connections 162, 163 with arms 164 that are secured to or formed integrally with the boss 147. Secured, as by pins 164' to the links 161 adjacent the slots 163 therein, are corresponding ends of springs 165 the opposite ends of which are secured, as by clips 166, to the arms 153, 154, at the free ends thereof. The arms 160 have secured thereto in any suitable manner, arms 167 of a plate 168 on one edge of which is riveted or otherwise suitably secured the folder 93. The links 161 and the springs 165 normally maintain the folders 93 at right angles to the arms 153 and 154, but provide for yielding movement of said folders to insure engagement of the same with the forms 40 and prevent damage to the folders.

The folders 91 and 93 fold in the panels 90 and 92 of the blanks 42, in overlapping relation on

the back of the forms 40, as previously described, and the folders 93 are, in accordance with the present invention, heated so that said overlapping panels or portions are heat sealed through the medium of the wax or substance with which the blank is coated or impregnated. Accordingly, the folders 93 are preferably heated electrically through the medium of heat elements applied thereto and travelling therewith, and the current for heating said elements may be supplied thereto from any suitable source. As herein shown, a generator 169 (Fig. 15) having a ground lead 170, is connected by a lead wire 171 with a contact 172 provided on a switch panel 173 made of suitable insulating material and mounted on the side frame 5 of the machine in any suitable manner. The switch panel 173 also has mounted thereon a switch 174 movable into engagement with the contact 172 and connected by a lead wire 175 with the resistance element 176 of a rheostat 177. This rheostat 177 is employed to vary the current in the heaters on folders 93, as desired, and includes an arm 177' movable along the element 176 in engagement therewith and connected by a lead wire 178 with an elliptical track 179 of copper or other suitable material mounted on a plate 180 of similar configuration and insulated therefrom in any suitable manner (Figs. 1, 2 and 4).

The plate 180 in turn, is mounted in any suitable manner on the brackets 142 above the ways 141, so that the track 179 is disposed in position for engagement by brushes 181 which are mounted on the folder carrying bosses 147 and travel around said track in engagement therewith as the folders 93 are moved continuously along their closed or endless path by the described means for this purpose. The brushes 181 extend in suitable slots formed in fiber blocks 182 which, together with said brushes, are secured in any suitable manner on fiber supports 183 at the upper ends thereof (Figs. 1, 2, 4, 12 and 13). The lower ends of the supports 183 are secured in any suitable manner on arms 184 which, in turn, are secured to, or formed integrally with, the bosses 147.

The brushes 181 have connected therewith, as at 185, lead wires 186 which are connected with lead wires 187. The lead wires 186 and 187, in turn, are connected at 188 with the arms 159 and are insulated therefrom in any suitable manner. The lead wires 187 are also connected, as at 189, with corresponding ends of resistance elements 190 enclosed in heaters 192 and insulated therefrom in any suitable manner. The heaters 192 are secured in any suitable manner on plates 193 which are secured, as by pin and slot connections 193', 193'', on the plates 168. The heaters 192 therefore act to heat the folders 93 carried thereby. Clips 193''' on the plates 193 also serve to hold the heaters 192 and the plates 193 thereon. The ends of the resistance elements 190 opposite those connected with the lead wires 187 are connected, as at 194, with lead wires 195 which, in turn, are connected, as at 196, with the lowermost arms 167 and thus grounded on the folder carrying means. It will appear, from the foregoing, that when the switch 174 is closed, current will be supplied to the resistance elements 190 of the heaters 192 through the described connections therefor with the generator 169, and said heaters will act to heat the folders 93 during operation of the same by the described mechanism for this purpose.

The forms 40 and the folders 91 and 93 travel continuously in timed relation such that said folders fold in and overlap portions of the blanks on the forms successively and heat seal the overlapping portions of said blanks in like manner. Accordingly, as a form 40 with a blank wrapped around the front and opposite sides thereof moves between the cams 123 and 157, one of the folders 91 and one of the folders 93 act to fold in, overlap, and heat seal the blank on the back of the form, as stated. The folder 91 is first moved inwardly through motion imparted thereto by engagement of the roller 121 with a dwell 198 (Fig. 4) in the cam 123, so that said folder engages the panel or portion 90 of the blank 42 and swings said panel or portion into engagement with the back of the form 40. The folder 91 is then moved outwardly a slight distance through engagement of the roller 120 with a dwell 198' in the cam 123, whereupon the folder 93 is moved inwardly back of the form through engagement of the roller 155 with a dwell 199 in the cam 157. The folder 93 thus engages the portion or panel 92 of the blank 42, swings it inwardly of the form in overlapping relation with the portion or panel 90, and heat seals the overlapping portions of the blank, whereupon the form 40 and the two folders 91 and 93 travel forwardly together, the folders 91 and 93 engaging the blank or liner and the form and being maintained in side by side relation against the back of the form through engagement of the rollers 121 and 155 with dwells 200 and 201 of the cams 123 and 157, respectively.

After the form and the folders have travelled forwardly a certain distance, the folder 93 is moved out of engagement with the form and the blank or liner thereon, through engagement of the roller 155 with a dwell 202 of the cam 157, whereupon the folder 91 is moved inwardly a slight distance on the form and the overlapping portions of the blank or liner thereon, through engagement of the roller 121 with a dwell 203 in the cam 122. Thereafter, the folder 91 is moved out of engagement with the form and the blank or liner thereon, through engagement of the roller 121 with a dwell 204 of the cam 122, whereupon the two folders are moved outwardly through engagement of the rollers 121 and 155 with the cam grooves 122 and 156 of the cams 122 and 157. The two folders 91 and 93 then move rearwardly and inwardly to fold in a blank on a succeeding form, as in the case of the first described folding operation.

It will, of course, be understood that as each form passes between the cams 123 and 157, one of the folders 91 and one of the folders 93 will fold the blank thereon in the manner already described. The number of folders 91, as previously pointed out, is greater than the number of folders 93, and this is preferable for the reason that it is desirable to hold an unheated folder 91 in engagement with the overlapping portions of the blank or liner on the back of the form after a heated folder 93 has been disengaged therefrom, until a sufficient time has elapsed for the wax or other substance to set and thus insure a perfect seal. The arrangement, construction, operation, and timing of the folders 91, 93 and the forms 40, however, are such that one folder 91 and one folder 93 always cooperate in the folding of a blank or liner on the back of each form 40 in the manner previously described.

The forms 40 and the blanks or liners successively pass top folding mechanism which acts to fold in and heat seal end portions of the blanks or liners one after another as the forms and

blanks or liners thereon successively pass said mechanism. This end folding and sealing mechanism includes stationary folding devices disposed rearwardly of end sealing means which, in accordance with the present invention, includes a rotatable heated positively driven roller and, if desired, a frictionally driven heated roller associated therewith. The stationary folding devices may be of any suitable type, but as herein shown, are preferably comprised by folding plates 205, 206, 207, and 208 (Figs. 2 and 4). The folding plate 205 is of irregular configuration and provided at opposite sides thereof with wings or extensions 209 and 210, respectively. This folding plate 205 has secured to or formed integrally therewith spaced pairs of lugs 211 in slots of which are received a holder 212 that is secured in any suitable manner to said lugs. The holder 212, in turn, is secured to or formed integrally with a cross member 213 which extends transversely of the machine and is supported on the side frames 5 and 6 therefor for movement relative thereto so that the folding plate 205 may yieldably engage the forms 40 and the blanks or liners thereon.

The folding plate 206 is mounted in any suitable manner on one of a pair of bars 216 and supported therefrom in spaced relation with the wing 210 of the folding plate 205. The folding plates 207 and 208 are hinged at 214 and 215, respectively, on one of a plurality of cross bars 217 adjustably connected with the bars 216. The bars 217 extend transversely of the machine and are secured in any suitable manner to the side frames 5 and 6 thereof.

As each form 40 with a blank or liner 42 thereon passes under the folding plate 205, the front top portion 218 of said liner or blank is folded down on the top of the form by a curved folder 219 which is secured to or formed integrally with the folding plate 205. Thereafter, the rear top portion 220 of the blank or liner is folded down on the top of the form 40 by a swinging folder 221 comprised by a roller or rollers journalled in any suitable manner on an arm 222 that is fixed on a rockshaft 223. This rockshaft 223 extends transversely of the machine and is journalled in suitable bearings on the side frames 5 and 6 at the tops thereof. Fixed on the rockshaft 223 is an arm 224 which is pivotally connected with one end of a link 225. The opposite end of the link 225 is pivotally connected with one end of a lever 226 which is pivotally mounted at 227 on the side frame 6 of the machine. The opposite end of the lever 226 has journalled thereon a roller 228 engaged in a closed cam 229 which is fixed on the shaft 43 and shaped to rock the folder 220 each time a form passes thereunder so that said folder folds in the rear top portion of the blank or liner under the folder 219 and onto the top of the form 40.

While the forms 40 and the blanks or liners thereon pass the movable and stationary folding devices, said blanks or liners are maintained in engagement with opposite sides of the forms by brushes 230, 230', 231, 231', 232, 232' and 233, 233' extending horizontally adjacent the tops and bottoms of the forms 40 (Fig. 6). The brushes 230, 231, 232 and 233 are mounted on brackets 234 adjustably secured in any suitable manner on the bars 216, and the brushes 230', 231', 232' and 233' are mounted on brackets 234' adjustably secured in any suitable manner on the cams 123 and 157. The several brushes, together with the movable and stationary folding devices, insure that the blanks 42 will be tightly held against the forms while said blanks are being formed into bags or liners or containers thereon. When the front and rear portions 218 and 220 of the liner blank have been folded down on top of the form, as before described, the opposite side portions 235 and 236 of said blank are swung outwardly between folder wing 209 and brush 232 and folder wing 210 and folder 206, respectively. In the continued travel of the form 40, the liner flap 235 is engaged between the folder plate 207 and a wing 237 of plate 205 and folded down on top of the form above the liner flaps 218 and 220, whereupon the liner flap 236 is engaged between the folder plate 208 and the wing 237 and folded down on top of the previously folded liner flap 235. The closed end portions of the liners or containers are thus formed one after another by the described folding devices for this purpose, and as each form and liner travels forwardly of the folding plate 208, the closed end of the liner or container is engaged and sealed by rotatable heated rolls which are preferably operated, mounted, constructed, and heated, as follows.

Fixed on the shaft 98 is a sprocket 238 around which passes a chain 239 which also passes over idler sprockets 240 and a sprocket 241 (Figs. 2 and 6). The idler sprockets 240 are journalled and mounted on the side frame 5 of the machine in any suitable manner and the sprocket 241 is fixed on a shaft 242 extending transversely of the machine and journalled on the side frames 5 and 6 at the tops thereof. Fixed on the shaft 242 and driven thereby through the described driving connections therefor with the shaft 98, is a gear 243 which meshes with a gear 244 that is fixed on a shaft 245 driven through said gears from the shaft 242. The shaft 245 is journalled in suitable bearings on the arms 246 of a yoke 247 carried by arms 248 loosely mounted on the shaft 242. The yoke 247 and the parts carried thereby, are yieldably supported from the bars 216 by a bolt 247' extending loosely through a suitable opening in one of a pair of small cross bars 247'' bolted or otherwise suitably secured to bars 216. The bolt 247' has mounted thereon a spring 250 disposed between the yoke 247 and the bar 247'' through which said bolt extends.

Fixed on the shaft 245 is a roller 251 driven by said shaft to rotate in engagement with the interfolded closed ends of the bags or containers on the forms 40 so as to heat seal said interfolded closed ends of said bags or containers. This driven heat sealing roller 251 is preferably heated electrically, and as herein shown, includes a plurality of heaters 252 which are arranged in suitable openings in said roller and have resistance elements 253 (Fig. 15) suitably insulated from the heaters and the roller and supplied with current as follows.

The contact 172 on the switch panel 173 is connected by a bus bar 254 with a contact 255 on said panel. Mounted on the panel 173 is a switch 256 which is adapted to be moved into engagement with the contact 255 and is connected with one end of a lead wire 257. The opposite end of the lead wire 257 is connected with the resistance element 258 of a rheostat 259 by means of which the current in the resistance elements 253 of heaters 252 may be varied as desired. This rheostat 259 includes an arm 260 which is movable over the resistance 258 in engagement therewith, and connected with the arm 260 is one end of a lead wire 261. The opposite end of the lead wire 261 is connected with short lead wires 262 and 263, the lead wire 262,

in turn, being connected with a circular contact ring 264 loosely mounted on, and insulated from, the shaft 245. This ring 264 is fixed on one of the arms 248 and insulated therefrom in any suitable manner.

Mounted on the roller 251 and rotating therewith in engagement with the contact ring 264 is a brush 265 connected with the resistance element 253 of one of the heaters 252 and suitably insulated from said roller to prevent grounding thereon. The resistance elements 253 of the several heaters 252 are connected in series, as by lead wires 266, the last heater of the series having its resistance element grounded on the roller 251. It will appear, from the foregoing, that when the switch 256 is closed, current will be supplied to the resistance elements 253 of heaters 252 during rotation thereof with the roller 251, and said roller will thus be heated and act to heat seal the closed ends of the liners or containers as the forms carrying them pass under said roller. A second heated roller 268 (Figs. 2 and 4) may, if desired, be provided to assist in heat sealing the closed ends of the liners or containers, and said roller may be positively driven, or may operate through frictional engagement thereof with the ends of the containers or liners and the forms 40. As herein shown, the roller 268 is frictionally operated, and said roller is preferably mounted, constructed, and heated as follows.

Loosely mounted on the shaft 242 and retained against endwise displacement thereon in any suitable manner, are arms 269 in the free ends of which are provided bearings for a shaft 270 on which the roller 268 is fixed. The shaft 270 passes through suitable openings in the arms 271 of a yoke 272. The yoke 272 is supported from the bars 216 by a bolt 273 which passes through a suitable opening in said yoke and one of the bars 247'' and carries a spring 274 disposed between the yoke and the bar 247'' associated therewith. The roller 268 engages the tops of the forms 40 and the closed ends of the liners or containers thereon, and said roller and the shaft 270 are thus rotated as the roller presses and heat seals the closed ends of the liners or containers. Mounted in suitable openings in the roller 268 are heaters 275 the resistance elements 276 of which are insulated in any suitable manner from said heaters and the roller 268 and connected in series by lead wires 277 (Figs. 6 and 15). Mounted on the roller 268 to rotate therewith, is a brush 277' insulated in any suitable manner from said roller and connected with one end of the first resistance element 276 of the series included in the heaters 275. One end of the last resistance element 276 of the series is grounded on the roller 268 and during rotation of said roller, the brush 277' engages a contact ring 279 of copper or other suitable material loosely mounted on the shaft 270 and insulated therefrom in any suitable manner. The ring 279 is fixed on one arm 271 of the yoke 272 and insulated therefrom in any suitable manner. This contact ring 279 has connected therewith one end of the lead wire 263 the opposite end of which is connected with the lead wire 261, as previously described, so that when the switch 256 is moved into engagement with the contact 255 current will be supplied to the resistance elements 276 of heaters 275 on roller 268 as well as to the resistance elements 253 of heaters 252 on roller 251. The two rollers thus act to press and heat seal the closed ends of the liners or containers, as previously described.

When the liners or containers have been formed, as above described, they may be removed in any suitable manner from the forms 40, to be placed in receptacles or used in various other ways, or said liners or bags or containers may, before removal of the same from the forms 40, have formed thereon cartons or the like which are lined by the containers or bags or liners. In the latter case, it is desirable to secure the liners or bags to the carton in order to prevent material from sifting between the two when the lined receptacles are filled. As herein shown, the liners or bags are of waxed paper and, in accordance with the present invention, the carton or the liner or bag, will have applied thereto heated wax or other wax-like substance similar to that with which the bag or liner is impregnated or coated, so that when the liner or bag and the carton or the like are assembled together, they will be secured to each other by said wax, and material will be prevented from sifting in between the carton and the bag or liner when the receptacle is filled.

In the embodiment of the invention herein disclosed, heated wax is applied to the liner or bag, whereupon a carton is formed on the bag or liner and the latter is secured to said carton by said wax, the wax applying means being preferably operated, mounted, and constructed as follows. Fixed on the shafts 101 and 135 at the upper ends thereof, are sprockets 280 around which pass chains 281 that also pass around idler sprockets 282 and driven sprockets 283 (Figs. 2, 4, 6 and 8). The idler sprockets 282 serve to regulate the tension of chains 281, as desired, and said sprockets are journalled and adjustably mounted on brackets 283' which are secured in any suitable manner on the side frames 5 and 6 of the machine.

The sprockets 283 are splined to and slidable along shafts 284 provided with collars 285 and carrying springs 286 which are mounted on said shafts between said collars and the hubs of the sprockets 283. The shafts 284 are journalled in any suitable manner on brackets 287 which are bolted or otherwise suitably secured on small brackets 288. The brackets 288, in turn, are bolted or otherwise suitably secured on brackets 289 the latter, in turn, being bolted or otherwise suitably secured on the upper way 39 at opposite sides thereof, so that the forms 40 travel between brackets 287 and 289 and wax applying and holding means carried thereby, respectively.

Secured to or formed integrally with the sprockets 283, are bevel gears 290 which mesh with similar gears 291 fixed on shafts 292 inclined inwardly and downwardly toward each other and journalled in suitable bearings on the brackets 287. The shafts 292 also have fixed thereon wax applying disks or wheels 293 which are inclined upwardly and inwardly toward each other and have beveled annular wax applying surfaces 294. These inclined wax applying wheels 293 extend within wax containing receptacles 295 which are bolted or otherwise suitably secured on the brackets 289, and said wheels are driven through the described driving connections therefor with the continously driven shafts 101 and 135. If, for any reason, the machine is started when wax in the receptacles 295 is congealed or not sufficiently melted, said wax would create resistance to the turning movement of the wheels 293. In this event, and in order to insure against damage to the wax applying wheels and driving means therefor, the connections between the shafts 284 and the sprockets 283 allow the latter to move longitudinally on

said shafts, thus affording slippage between the bevel gears 290 and 291. When the wax in the receptacles 295 is melted, the springs 286 act to engage the bevel gears 290 with the bevel gears 291 so that the wax applying wheels 293 are rotated, as above described. Accordingly, during the normal operation of the machine, the forms 40 with liners or containers thereon pass one after another between the rotating wax applying wheels 293 and the latter apply stripes of heated wax on opposite sides of the liners or containers. In order to insure against sticking of the liners or containers to the forms 40, when the liners or containers are sealed thereon and the stripes of wax are applied to opposite sides of the liners or containers, said forms are provided on the front, top, and rear sides thereof with corrugations 296 and on the sides with wood strips 297 or the like against which the wheels 293 bear when applying stripes of heated wax to opposite sides of the liner. These strips 297 are secured in any suitable manner in grooves formed in opposite sides of the forms 40, respectively.

The wax in the receptacles 295 is, in accordance with the present invention, heated to maintain the same in a melted condition for application by the wheels 293 to the liners or containers, and said wax is preferably heated electrically in the following manner. The contact 255 on the switch panel 173 has connected therewith a bus bar 298 which is also connected with a contact 299 on said panel (Fig. 15). The panel 173 has mounted thereon a switch 300 movable into engagement with the contact 299 and connected with one end of a lead wire 301. The lead wire 301 has branches 302 connected with corresponding ends of resistance elements 303 forming parts of heaters 304 secured in any suitable manner on the bottoms of the wax receptacles 295 and serving to heat the wax therein. The resistance elements 303 are insulated in any suitable manner from the heaters 304 and the receptacles 295. The opposite ends of the resistance elements 303 are grounded in any suitable manner on the receptacles 295, and when the switch 300 is closed, current will be supplied to the resistance elements 303 by the described means for this purpose, and the heaters 304 will heat the receptacles 295 and the wax therein.

Additional heaters are preferably employed on the sides of the wax receptacles 295, these additional heaters preferably being of the same type as the heaters 304 and supplied with electrical current as follows. The contact 299 on the switch panel 173 has connected therewith a bus bar 306 which is also connected with a contact 307 on said switch panel. The switch panel 173 has mounted thereon a switch 308 movable into engagement with the contact 307 and connected with one end of a lead wire 309. This lead wire 309 has branches 309' connected with corresponding ends of resistance elements 310 forming parts of heaters 311 secured in any suitable manner on opposite sides of the receptacles 295. The resistance elements 310 are insulated in any suitable manner from the heaters 311 and the receptacles 295, and the opposite ends of said resistance elements 310 are grounded on said receptacles. When the switch 308 is closed, current will flow in the resistance elements 310 through the described means for this purpose. The heaters 311 will thus heat the receptacles 295 and melt the wax therein, the provision of heaters on the sides, as well as the bottoms of the receptacles 295 enabling the wax to be melted quickly when the machine is started. After the wax in the receptacles has been melted, the bottom heaters 304 or the side heaters 311 may be thrown out of operation, so that one or the other serves to keep the wax in the receptacles 295 in melted condition. All of the heaters may, however, be employed, if desired, in accordance with the particular conditions of operation of the machine and the particular nature of the wax employed.

After the closed ends of the liners or containers are heat sealed, the forms and the liners or containers thereon pass one after another under a cooling plate 312 (Figs. 2, 4 and 6) which cools the sealed ends of said liners or containers. This plate 312 is provided therein with air vents or openings 312^a and is yieldably supported, as by a bolt 312^b and a spring 312^c, on an extension 312^d of one of the cross members 217. The bolt 312^b is threaded in a suitable opening in the plate 312 and extends upwardly through a suitable opening in the extension 312^d. The spring 312^c is mounted on the bolt between the extension 312^d and a collar 312^e on said bolt. The bolt is provided above the extension 312^d with a nut 312^f, and the plate 312 has secured to, or formed integrally therewith, a curved end 312^g under which the forms 40 and the liners thereon pass in engagement with said plate. The forms 40 and the liners thereon pass one after another to mechanism for forming cartons thereon as follows.

The cartons B (Fig. 10) are made from blanks 313 which are fed into the path of travel of the forms 40 one after another and formed into containers thereon by mechanism which is preferably operated, mounted, and constructed as disclosed in Patent No. 1,674,921 granted June 26, 1928, to G. A. Robinson, and in my co-pending application Serial No. 418,349, filed January 3, 1930. Accordingly, the shaft 30 has fixed thereon a sprocket 314 around which passes a chain 315 which also passes around a sprocket 316 which is fixed on a shaft 317 extending transversely of, and journalled in suitable bearings on spaced frames 318 and 319 (Figs. 3 and 5). The frames 318 and 319 are bolted or otherwise suitably secured on frame members 320 and 321 supported at their ends by standards 322 which, in turn, are bolted or otherwise suitably secured to the machine foundation 9.

The frame members 320, 321 extend forwardly over the liner and carton making machine and are supported thereon by cross members 323 extending transversely of said frame members and bolted or otherwise suitably secured thereto (Figs. 2 and 3). The cross members 323, in turn, extend transversely of, and are bolted or otherwise suitably secured to, frames 324 and 325 mounted on the side frame members 5 and 6 and bolted or otherwise suitably secured thereto in any suitable manner. Mounted on the frames 318 and 319, the standards 322, and base plates 326 for the latter, is an elevator including endless driven chains 327 operated from the shaft 317, as disclosed in application Serial No. 418,349 above referred to, and supporting a stack 328 of carton blanks 313 which are separated one after another from the top of the stack and fed forwardly in like manner by a separator roller 329. This roller 329 is supported in engagement with the top of the stack by a weighted yoke journalled on the shaft 317, and said roller is

driven from said shaft by suitable gearing for this purpose. Journalled on the frame 319, is a short vertical shaft 330 which is driven in any suitable manner from the shaft 317 and carries a bevel gear 331 which meshes with a similar gear 332. The gear 332 is fixed on a horizontally arranged cam shaft 333 extending longitudinally of the frame member 21 and journalled in suitable bearings thereon. The elevator 327, the separator roller 329, and the cam shaft 333 are thus operated by the connections therefor with the shaft 30.

The blanks 313, separated and forwarded successively from the top of the stack by the roller 329, are delivered thereby one after another between upper and lower feed tapes 334 and 335 respectively that pass around suitable rollers which are arranged at opposite ends of said tapes and journalled in suitable bearings on brackets bolted or otherwise suitably secured to the frame members 320 and 321. The tapes 334 and 335 are driven by suitable gearing from the cam shaft 333, as disclosed in Patent No. 1,674,921 above referred to, said gearing also serving to drive a rotary brush 336 mounted in any suitable manner adjacent the separator roller 329 and serving to clean the latter. The blanks 313 between the tapes 334 and 335 are fed thereby past a flap bender 337 and a side registering device 338 for registering the blanks therewith. This flap bender 337 and the side registering device 338 are mounted and operated as disclosed in Patent No. 1,674,921, the flap bender serving to bend a sealing flap 339 of each carton blank 313 at right angles thereto.

Each blank 313, with the flap 339 thereof bent as previously described, is fed by the tapes 334, 335 to the grippers 340 of a turning roll 341 comprised by wheels on disks fixed on a shaft 342 extending transversely of the frame members 320, 321 and journalled in suitable bearings thereon (Figs. 2 and 5). The turning roll 341 and the grippers 340 thereon, are operated by the mechanism for this purpose disclosed in Patent No. 1,674,921 and including a bevel gear 343 fixed on the shaft 342 at one end thereof and meshing with a similar gear 344 fixed on the driven cam shaft 333.

Each blank 313 seized by the grippers 340 of turning roll 341 is turned thereby from a substantially horizontal position to a substantially vertical position and fed downwardly into the path of travel of one of the forms 40. During downward travel of the blanks, the flap 339 of each blank has applied thereto adhesive, through the medium of glue mechanism which is mounted, constructed, and operated as disclosed in Patent No. 1,674,921. This glue mechanism includes a glue wheel 345 fixed on a shaft 346 and turning in glue contained in a box 347 supported by a bracket 347' on the frame 6 of the machine (Figs. 2 and 4). The shaft 346 is journalled in suitable bearings on the glue box bracket 347', and said shaft has fixed thereon a sprocket 348 around which passes a chain 349. The chain 349 also passes around a sprocket 350 fixed on the continuously rotating cam shaft 333, and it will thus appear that the glue wheel 345 is driven by the described driving connections therefor with said cam shaft.

The glue wheel 345 applies glue to the periphery of a roller 351 driven by suitable gearing from the glue wheel shaft 346 and mounted in any suitable manner on the glue box bracket 347'. A second roller 352 mounted in any suitable manner on the glue box bracket 347', is moved toward and away from the roller 351 by suitable mechanism for this purpose operated from the cam shaft 333, as disclosed in Patent No. 1,674,921. As the blanks 313 are fed downwardly from the turning roll 341, they pass between a guide plate 353 and guide bars 353' disposed vertically in spaced relation and supported in any suitable manner on the side frames 5 and 6 of the machine. As each blank 313 passes through the guides 353, 353', the bent flap 339 passes between the rollers 351 and 352, and adhesive is applied to said flap.

The blanks 313 are fed downwardly between the guide plate 353 and the guide bars 353', by rollers 354 and 355 extending therein. The rollers 354 are fixed on a shaft 354' journalled in suitable bearings on the guide plate 353 and extending transversely thereof. The shaft 354' and the rollers 354 thereon are driven from the shaft 342 by means of a sprocket 356 fixed on the shaft 354', a chain 357 passing around said sprocket, and a sprocket 358 fixed on the shaft 342 and around which the chain 357 also passes. The rollers 355 are fixed on a shaft 359 journalled in arms 360 pivoted on the guide plate 353 and said shaft and said rollers are driven through suitable gearing from the shaft 354'.

The plate 353 is provided in the bottom portion thereof with an opening 362 through which the forms 40 and the liners or containers thereon travel one after another. As the blanks 313 are fed by the rollers 354, 355 one after another between the guide bars 353' and the plate 353, they are seized by feed rollers 363 and 364 which feed each blank downwardly onto stops 365 mounted in any suitable manner on the plates 361 at opposite sides of the openers 362 therebetween. The feed rollers 363 extend through suitable openings in the plate 353 and are driven from the shaft 354' which, for this purpose, has fixed thereon a sprocket 366. Passing around the sprocket 366 is a chain 367 which also passes around a sprocket 368 that is fixed on a shaft 369. The rollers 363 are also fixed on the shaft 369, and said shaft extends transversely of the machine and is journalled in suitable bearings on the side frames 5 and 6 thereof. The rollers 364 are driven from the shaft 369 by suitable gearing for this purpose, and said rollers are fixed on a shaft 370 extending transversely of the machine and journalled in suitable bearings on arms 361 mounted in any suitable manner on the plate 353.

As each carton blank 313 with the side flaps 339 thereof bent and glued in the manner previously described, is delivered onto the stops 365, one of the forms 40 travelling toward said blank engages the same and forces the blank between rollers 371 between which the forms 40 travel. These rollers 371 are journalled in any suitable manner on the plates 353, and as a form with a liner or container thereon in a carton blank in front of the same passes through said rollers, the blank is folded around the front and opposite sides of the form and sealed to the liner or container by the stripes of wax applied thereto through the medium of the wax applying wheels 293. When the carton blank is thus folded around the form and the liner or container thereon the bent panel 339 with its glued face disposed outwardly, is engaged over the rear side of the liner and form at one corner thereof. The rear panel 372 (Fig. 10) of the carton is then folded onto the back of the form and the

liner or container over the glued flap 339 and sealed thereto. The means for so folding and sealing the rear panel 372 comprises a folder 373 (Fig. 5) which moves inwardly to swing the panel 372 in the same direction and seal it on the flap 339, then forwardly with the form and the container, then outwardly therefrom, then rearwardly and thereafter inwardly to repeat the same cycle of operations with respect to the carton blank and the container on the succeeding form 40. It will thus appear, that the folder 353 successively folds in panels 372 of cartons on successive forms 40 as the latter travel one after another past said folder.

The folder 373 is operated, mounted, and constructed in substantially the same manner as the rear panel folder disclosed in Patent No. 1,674,921. Accordingly, the shaft 34 has fixed thereon a sprocket 374 around which passes a chain 375 that also passes around a sprocket 376 fixed on a shaft 377 extending transversely of the machine and journalled in suitable bearings on the side frames 5 and 6 thereof (Figs. 2 and 3). Fixed on the shaft 377 is a sprocket 378 around which passes a chain 379 that also passes around a sprocket 380 fixed on a shaft 381 extending transversely of the machine and journalled in suitable bearings on the side frames 5 and 6 thereof. The shaft 381 is thus driven continuously through the described driving connections therefor with the shaft 34, and said shaft 381 constitutes the main driving shaft for devices that impart the described travelling and folding motions to the folder 373.

The forward and rearward movement of the folder 373 is derived from the shaft 381 through a bevel gear 382 which is fixed on said shaft and meshes with a similar gear 383. The bevel gear 383, in turn, is fixed on a shaft 384 at the lower end thereof, said shaft being journalled in suitable bearings on the side frame 5 of the machine. Fixed on the upper end of the shaft 384 is a sprocket 385 around which passes a chain 386 that also passes around a sprocket 387 fixed on a short vertical shaft 388 at the lower end thereof. This shaft 388 is journalled in a suitable bearing on a box-shaped bracket 389 which is bolted or otherwise suitably secured to the side frame 5 of the machine. (Figs. 2 and 5). Fixed on the upper end of the shaft 388 is a sprocket 390 around which passes a chain 391 that also passes around a sprocket 392 fixed on the upper end of a short vertical shaft 393. This shaft 393 is journalled in a suitable bearing on the bracket 389, and the chain 391 is thus driven continuously by the described driving connections therefor with the shaft 381.

Fixed on the chain 391 is a driving block 394 a pin or extension 395 of which is engaged in a suitable opening formed in a slide 396. This slide 396 is mounted in suitable guides on a carriage 397, for movement transversely of the direction of movement of the forms 40. The carriage 397 carries the folder 373 and said carriage is slidably mounted on rods 398 extending in parallel relation with the path of travel of the forms 40. It will thus appear, that during operation of the machine, the carriage 397 and the folder 373 are reciprocated in the direction of movement of the forms 40, by the described driving connections for said carriage with the shaft 381.

The inward and outward swinging movements of the folder 373 are likewise derived from the shaft 381 which, for this purpose, has fixed thereon to rotate continuously therewith a cam 399 (Fig. 2). This cam 399 has engaged in the cam groove 400 thereof, a roller 401 which is journalled on an arm 402 pivotally mounted at 403 on the side frame 5 of the machine. The free end of the arm 402 has connected therewith, as by a universal connection, one end of a link 404 the opposite end of which is likewise connected with one arm 405 of a bell crank 406. This bell crank 406 is fixed on a rockshaft 407 extending in parallel relation with the guide rod 398 and journalled in suitable bearings on the bracket 389. One end of the rockshaft 407 has fixed thereon an arm 408 with which is connected one end of a rod 409 the opposite end of which is connected with the other arm 410 of the bell crank 406. The rod 409 extends between rollers 411 journalled in spaced relation on a slide 412 extending diagonally across the carriage 397 and guided thereon in any suitable manner. The folder 373 is pivotally mounted at 413 on one end of the slide 412, and said folder receives its inward and outward movement as said slide is reciprocated through the described connections therefor with the shaft 381.

The folder 373 is also swung, at proper intervals, to swing in and seal the panel 372 of the carton, and for this purpose, the folder has connected therewith one end of an arm 414 the opposite end of which is pivotally connected with one end of a link 415. The opposite end of the link 415 is pivotally connected with the guide for the slide 412. The forms 40 and the folder 373 are operated in such timed relation, that as each form approaches the folder, the latter moves inwardly on the back of the form to engage the panel 372 of the carton on the outer rear corner of the form and thus crease the corresponding corner of the carton thereon. The folder is then swung, by the arm 414 and the link 415, moving the panel 372 onto the form over the glued sealing flap 339 of the carton and sealing said panel thereon. The folder then travels forwardly with the form pressing the overlapping panel and flap to secure them together, whereupon the folder is swung away from the form and then moved outwardly and rearwardly for subsequent movement to fold in the rear panel of the carton on the next form 40, in the same manner. It will thus appear, that the folder 373 acts to side-seal the cartons on the form successively as the latter travel in like manner past said folder.

After each carton is side-sealed on the form and secured to the liner, as previously described, one end of the carton is closed and sealed over the closed and sealed end of the liner or container. Accordingly, the end flap 416 of the carton is folded down on top of the liner and form by a stationary folder 417 (Fig. 2) under which the forms travel one after another. This folder 417 is supported in any suitable manner, as by a cross member extending transversely of the machine and secured to the side frames 5 and 6 at the tops thereof. The opposite end flaps 418 of the carton is folded down on top of the form and the liner or container by a movable folder 419 carried by an arm 419' fixed on a rockshaft 420 extending transversely of the machine and journalled in suitable bearings on the side frames 5 and 6 of the machine. This rockshaft 420 has fixed thereon an arm 421 with which is pivotally connected one end of a link 422. The opposite end of the link 422 is pivotally connected with an arm 423. This arm 423 is pivotally mounted at 424 on the side frame 6 of the machine and

carries a roller 425 which is engaged in the groove of a closed cam 426. The cam 426 is fixed on the shaft 34 at the end thereof opposite that carrying the sprocket 33, and said cam is so shaped that as each carton passes under the folder 419, the same is moved to fold down the flap 418 through the described connection for said folder with the cam 426.

As the carton flaps 416 and 418 are folded by the described means for this purpose, and the form with the carton thereon moves forwardly, said flaps are held down by a suitable guide rail for this purpose and the side flaps 427 and 428 of the carton are bent outwardly by the folder 417 and engaged under guide rails 417' supported on the machine frame work in any suitable manner. The flaps 427, 428 are thereafter engaged by glue wheels 429 which apply glue to said flaps, and said glue wheels are fixed on a shaft 430 and extend within boxes 431 containing glue or other adhesive. The glue boxes 431 are mounted in any suitable manner on the side frames 5 and 6 of the machine, and the shaft 430 extends transversely of, and is journalled in suitable bearings, on said glue boxes. The shaft 430 and the glue wheels 429 thereon are preferably driven from the shaft 20 which, for this purpose, has fixed thereon a pinion 432 which meshes with a gear 433 that is fixed on the shaft 430.

It will appear, from the foregoing, that glue is applied to the flaps 427, 428 of the cartons as the forms and cartons thereon travel one after another past the described means for this purpose. The forms and cartons, after passing the glue wheels 429, turn downwardly and travel in the opposite direction past stationary folders 434 and 435, the folder 434 serving to fold in and seal the flap 427 on the flaps 416 and 418, and the folder 435 serving to fold in and seal the flap 428 on the flap 427 (Fig. 3). Thereafter, the forms and the cartons thereon travel over a press mechanism indicated broadly at 436 (Figs. 2 and 3) which acts to press the sealed ends of the cartons prior to delivery of the same from the forms in a manner to be presently described. This press mechanism 436 may be of any suitable or well known construction, and is supported in any suitable manner on the side frames 5 and 6 of the machine between the same, and at the bottoms thereof. The movable parts of the press mechanism are driven by a belt 436' from the shaft 377.

It will appear, from the foregoing, that as the forms and cartons thereon travel one after another past the folders 434, 435 and over the press mechanism 436, the flaps 427 and 428 of successive cartons will be closed and sealed, as described, whereupon the cartons may be moved one after another from the successive forms 40. Removal of the lined cartons from the forms may be accomplished by blasts of air delivered thereto, or by mechanical means, as desired. In the embodiment of the invention herein shown, the lined cartons are removed from the forms 40 by inclined guide rails 437 (Figs. 1 and 2) extending from one end of the press mechanism 436 to one end of the machine proper and arranged to engage the open ends of the lined cartons successively to strip them one after another from the successive forms 40. The inclined guide rails 437 are secured in any suitable manner to the side frames 5 and 6 of the machine, and terminate at corresponding ends in sharply inclined portions 438. Guides 439 and 440 finally strip the cartons from the forms 40 for delivery onto a carton transporting means 441 or to any other suitable point of delivery. The carton transporting means 441 is driven by a chain 442 from the shaft 98, and the guides 439 and 440 are secured in any suitable manner on the ways 39 and the brackets 37', respectively.

The operation of the entire machine will be readily understood from the foregoing, and may be briefly summarized as follows. A waxed liner 42 cut from the web and delivered onto the stops 86 by the described means for this purpose, is engaged by one of the forms 40 which travels through the rollers 87 and folds the liner around the form. In continued travel of the form, one of the folders 91 and one of the folders 93 fold in the rear panels or portions 90 and 92 of the liner and heat seal the overlapping parts of said panels or portions. As the form 40 with the side-sealed liner thereon passes the folders 219 and 221 the latter fold in the front and rear end portions 218 and 220 of the liner, whereupon the form and the liner pass the devices 207, 237, 208 which fold in the side portions 235 and 236 of the liner.

In the continued movement of the form 40 and the side-sealed liner or container thereon, the same pass the wax applying wheels 293 which apply stripes of hot wax to opposite sides of said container or liner, respectively. In the meantime, the form 40 with the side-sealed and end-closed liner or blank thereon passes under the rollers 251 and 268 which heat seal the closed end of the liner or container, wherepon the form with the side and top sealed liner or container thereon approaches the plate 353 at the time a carton blank 313 is delivered onto the stops 365. The form 40, in its continued travel, forces the carton blank between the rollers 371 so that the carton blank 313 is folded around the front and side of the form on the side and end sealed liner and secured thereto by the stripes of wax applied on the latter. Thereafter, the form with the liner and carton thereon passes the folder 373 which folds in and seals the panel 372 of the carton on the flap 339 thereof. The form 40 with the side-sealed and lined carton thereon then passes the several devices for end closing and sealing the carton, whereupon the form and the carton pass over the press mechanism 436 and the carton is thereafter stripped from the form by the described means for this purpose. The forms 40 travel continuously one after another past the various liner and carton forming devices and have lined cartons formed thereon one after another in the manner above pointed out.

In the embodiment of the invention herein disclosed, the liner forming mechanism and the carton forming mechanism cooperate in the making of lined cartons one after another. The liner forming mechanism may, however, be separate from the carton forming mechanism, and may be employed to make bags or containers used for lining cartons, or for various other purposes, as desired. Accordingly, while one embodiment of the present invention has been illustrated and described herein with more or less particularity, it is to be expressly understood that the invention is not limited to said embodiment, or otherwise than by the terms of the appended claims.

What is claimed is:

1. In a machine of the character described, a movable form on which a waxed liner blank and a carton blank may be wrapped or folded, means

movable with said form during a portion of its travel for wrapping or folding the waxed liner blank on said form and adapted to heat seal said blank, mechanism for operating said movable means, and means for wrapping or folding the carton blank on the movable form and the waxed liner blank to form a carton with a waxed liner therein.

2. In a machine of the character described, a movable form on which a waxed liner blank and a carton blank may be wrapped or folded, means for wrapping or folding the waxed blank on said form and including a continuously movable folding device adapted to heat seal said blank, mechanism for operating said folding device, and means for wrapping or folding the carton blank on the movable form and said waxed liner blank to form a carton with a waxed liner therein.

3. In a machine of the character described, a movable form on which a waxed liner blank and a carton blank may be wrapped or folded, means for wrapping or folding the waxed blank on said form and including a folding device movable with said form during a portion of its travel and adapted to heat seal said blank, means for operating and heating said folding device, and means for wrapping or folding and sealing the carton blank on the movable form and said waxed liner blank to form a carton with a waxed liner therein.

4. In a machine of the character described, a movable form on which a waxed liner blank and a carton blank may be wrapped or folded, means for feeding the waxed blank into the path of travel of the form, continuously movable means for wrapping or folding the waxed blank on the form and adapted to heat seal said waxed blank, mechanism for operating said movable means, means for feeding the carton blank into the path of travel of the form, and means for wrapping or folding said carton blank on the form and the waxed liner blank to form a carton with a waxed liner therein.

5. In a machine of the character described, a movable form, means for forming a waxed liner on said form and including a folding device traveling with said form and adapted to heat seal said liner, mechanism for operating said folding device, and means for forming a carton with said waxed liner therein.

6. In a machine of the character described, means for forming a waxed liner with overlapping portions, said means including a continuously movable form about which said liner is folded, a continuously movable folding device adapted to heat seal said liner through the medium of the wax of overlapping portions thereof, means for heating said device, and means for forming a carton with said waxed liner therein.

7. In a machine of the character described, means for forming a waxed liner with overlapping portions, said means including a continuously movable form about which said liner is folded, a folding device movable with said form and adapted to heat seal said liner through the medium of the wax of overlapping portions thereof, means for heating the movable folding device, mechanism for operating the movable heated folding device, and means for forming a carton with said waxed liner therein.

8. In a machine of the character described, a movable form on which a waxed liner blank and a carton blank may be wrapped and folded, means movable with said form for wrapping or folding the waxed liner blank around the form and adapted to heat seal overlapping side portions of said waxed liner blank, mechanism for operating said movable means, devices for folding and heat sealing end portions of the waxed liner blank, and means for wrapping and folding the carton blank on the movable form and the folded and sealed waxed liner blank to form a carton with a waxed liner therein.

9. In a machine of the character described, a movable form on which a waxed liner blank and a carton blank may be wrapped and folded, movable means for wrapping or folding the waxed liner blank around the form and adapted to heat seal overlapping side portions of said waxed liner blank, mechanism for operating said movable means, devices for folding and heat sealing end portions of the waxed liner blank and including a heated rotatable roller, and means for wrapping and folding the carton blank on the movable form and the folded and sealed waxed liner blank to form a carton with a waxed liner therein.

10. In a machine of the character described, a movable form on which a waxed liner blank and a carton blank may be wrapped and folded, movable means for wrapping or folding the waxed liner blank around the form and adapted to heat seal overlapping side portions of said waxed liner blank, mechanism for operating said movable means, stationary and movable devices for folding and heat sealing end portions of the waxed liner blank and including a driven heated roller, and means for wrapping and folding the carton blank on the movable form and the folded and sealed waxed liner blank to form a carton with a waxed liner therein.

11. In a machine of the character described, a continuously traveling member, means for forming a waxed liner on the traveling member and including a device movable with and relative to said member adapted to fold a portion of the waxed liner thereon, means for heating the device whereby it heat seals said liner, means past which the member and the liner travel and adapted to apply heated wax on the liner, and means for forming a carton on the traveling member and the liner so that the latter is disposed in the carton and secured thereto by said wax.

12. In a machine of the character described, a plurality of movable elements, mechanism for forming wax liners on the elements one after another and including means movable with and relative to the movable elements and adapted to fold portions of the liners and heat seal each of the same, and means for forming cartons on the liner carrying elements successively with the waxed liners disposed in said cartons and removable therewith from said elements.

13. In a machine of the character described, a movable element on which a container may be formed, means for forming a container on said element and including a heated folder movable with said element during a portion of its travel and adapted to heat seal said container, and mechanism for operating said heated folder.

14. In a machine of the character described, a movable element on which a container may be formed, means for forming a container on said element and including a folder movable with said element during a portion of its travel and mechanism for operating the same, and means for heating said folder whereby it heat seals said container.

15. In a machine of the character described, a continuously moving element on which a waxed

liner may be formed, and means for forming the waxed liner on the continuously moving element and including a continuously moving heated folder adapted to heat seal said liner.

16. In a machine of the character described, a continuously moving element on which a waxed liner may be formed, means for forming the waxed liner on the continuously moving element and including a continuously moving heated folder adapted to heat seal said liner, and means for moving the heated folder into and out of operative relation with said element during movement of the latter and said folder.

17. In a machine of the character described, a continuously movable element, means for feeding a blank thereto, means for forming the blank into an article on said element and including a heated folder movable with said element and adapted to heat seal said article, and mechanism for operating said heated folder.

18. In a machine of the character described, a continuously movable element, means for feeding a waxed blank thereto, means for forming the waxed blank into an article on said element with parts in overlapping relation, a movable heated folder forming part of said last named means and adapted to remain in contact with said overlapping parts during a portion of the travel of said continuously movable element and thereby heat seal said overlapping parts of the article, and mechanism for operating said movable heated folder.

19. In a machine of the character described, a continuously movable element on which a container may be formed, means movable with said element for forming a container on said movable element, and rotatable heated means for sealing said container.

20. In a machine of the character described, a continuously movable element, means movable with said element during a portion of its travel for wrapping or folding a blank on said element to form a container thereon, and driven heated means for sealing said container.

21. In a machine of the character described, a continuously movable element, means for forming a container on said element and including a heated folder movable with said element and adapted to heat seal the container along one side thereof, and driven heated means past which said element and the container travel and adapted to engage and heat seal one end of said container.

22. In a machine of the character described, means for forming a waxed liner adapted to heat seal the same, an element movable past said means and on which the waxed liner is formed thereby and heat sealed, wax containing means in the path of travel of the element and the liner, means for heating wax in the containing means therefor, movable wax applying means extending in the wax containing means and adapted to apply heated wax on the liner to secure the same in a receptacle, and mechanism for operating said movable wax applying means.

23. In a machine of the character described, a receptacle for wax, means for heating wax therein, a movable wax applying device, extending in the receptacle, means for driving said device whereby it may apply heated wax on an article, and means for permitting relative movement between said driving means and said device when said wax is not properly heated.

24. In a machine of the character described, a receptacle for wax, means for heating wax therein, an inclined disk or wheel extending in the receptacle, and means for rotating said wheel whereby it may apply heated wax on an article, said last named means including a yieldable driving member adapted to permit relative movement between said wheel and said rotating means until said wax has been heated to a predetermined temperature.

25. In a machine of the character described, opposed wax receptacles arranged in spaced relation and between which a support and a container thereon may travel, rotatable wax applying devices extending in the receptacles and inclined toward each other, and means for operating said rotatable wax applying devices whereby they may apply heated wax to said container, said operating means including yieldable driving means adapted to permit relative movement between said operating means and said devices when said wax is congealed.

26. In a machine of the character described, a movable element on which a container may be formed, opposed endless devices arranged in spaced relation and between which the movable element may travel, and means for forming a container on said element and including a folder movably mounted on each endless device and mechanism for driving said devices and operating said folders.

27. In a machine of the character described, a movable element on which a container may be formed, opposed endless devices arranged in spaced relation and between which the movable element may travel, means for forming a container on said element and including a folder movably mounted on each endless device and mechanism for driving said devices and operating said folders, and means for heating one of said folders whereby it heat seals said container.

28. In a machine of the character described, a plurality of movable elements on which containers may be formed, opposed endless devices arranged in spaced relation and between which the movable elements may travel, and means for forming containers on said movable elements successively and including a plurality of folders movably mounted on each endless device and mechanism for driving said devices and operating said folders.

29. In a machine of the character described, a plurality of movable elements on which containers may be formed, opposed endless devices arranged in spaced relation and between which the movable elements may travel, means for forming containers on said movable elements successively and including a plurality of folders movably mounted on each endless device and mechanism for driving said devices and operating said folders, and means for heating the folders on one of the endless devices whereby the last named folders heat seal the containers.

30. In a machine of the character described, an endless driven device, a folder mounted on the endless driven device to travel therewith and move thereon, and means for heating said folder.

31. In a machine of the character described, opposed pluralities of folders, means for moving each plurality of folders in a closed path, mechanism for operating the folders of each plurality during movement of the same as aforesaid, and means for heating the folders of one of said pluralities.

32. In a machine of the character described, a plurality of supports for articles, means for

moving the supports continuously in a closed path, a plurality of folders past which said supports may travel, means for moving the folders continuously in a closed path, mechanism for operating the folders as they travel in said path, and means for heating said folders.

33. In a machine of the character described, a continuously movable form, means for wrapping or folding a waxed liner blank on said form with overlapping portions including a pair of continuously movable folders adapted to travel with said form during a portion of its movement, means for operating said folders, means for heating one of said folders to heat seal said waxed liner blank through the medium of the wax of said overlapping portions, and means for wrapping or folding a carton blank on said form and said wax liner blank to form a carton with a waxed liner therein.

34. In a machine of the character described, a continuously movable form, means for wrapping or folding a waxed liner blank on said form with overlapping portions including a pair of continuously movable folders adapted to travel with said form during a portion of its movement, means for operating said folders, means for heating one of said folders to heat seal said waxed liner blank through the medium of the wax of said overlapping portions, means for applying a stripe of heated wax to said liner, and means for wrapping or folding a carton blank around said waxed liner blank to be secured thereto by said wax to form a carton with a waxed liner therein.

35. In a machine of the character described, a plurality of continuously movable forms, means for forming a waxed liner on each of said forms including a plurality of pairs of folders continuously movable in closed paths and in company with said forms during a portion of their travel, means for operating the folders of each of said pairs in succession to wrap a waxed liner blank around each of said forms, and means for heating one folder of each of said pairs to heat seal the waxed liner through the medium of the wax in overlapping portions thereof.

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