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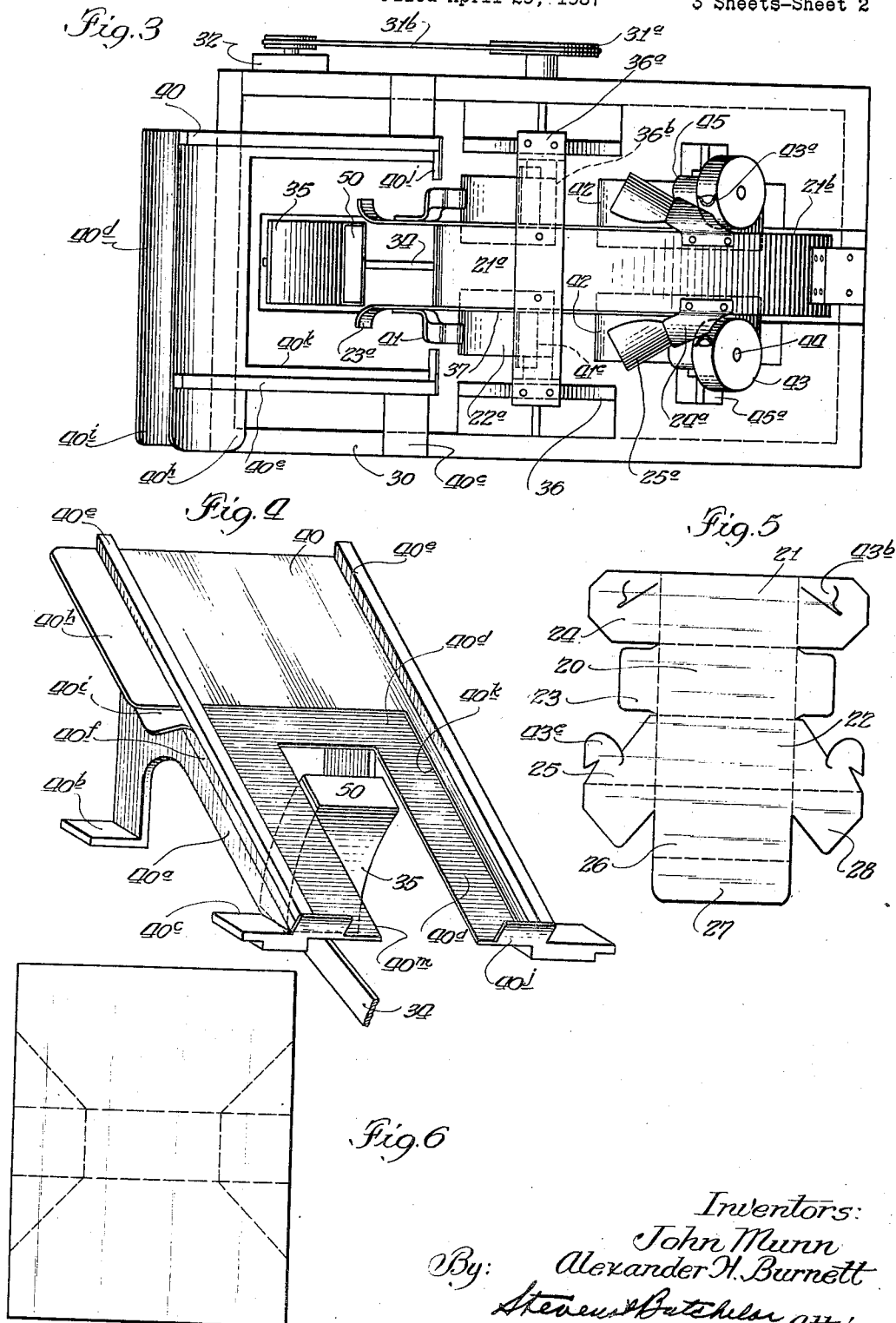
J. MUNN ET AL

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CARTON FORMING AND LINING MACHINE

Filed April 29, 1937

3 Sheets-Sheet 2



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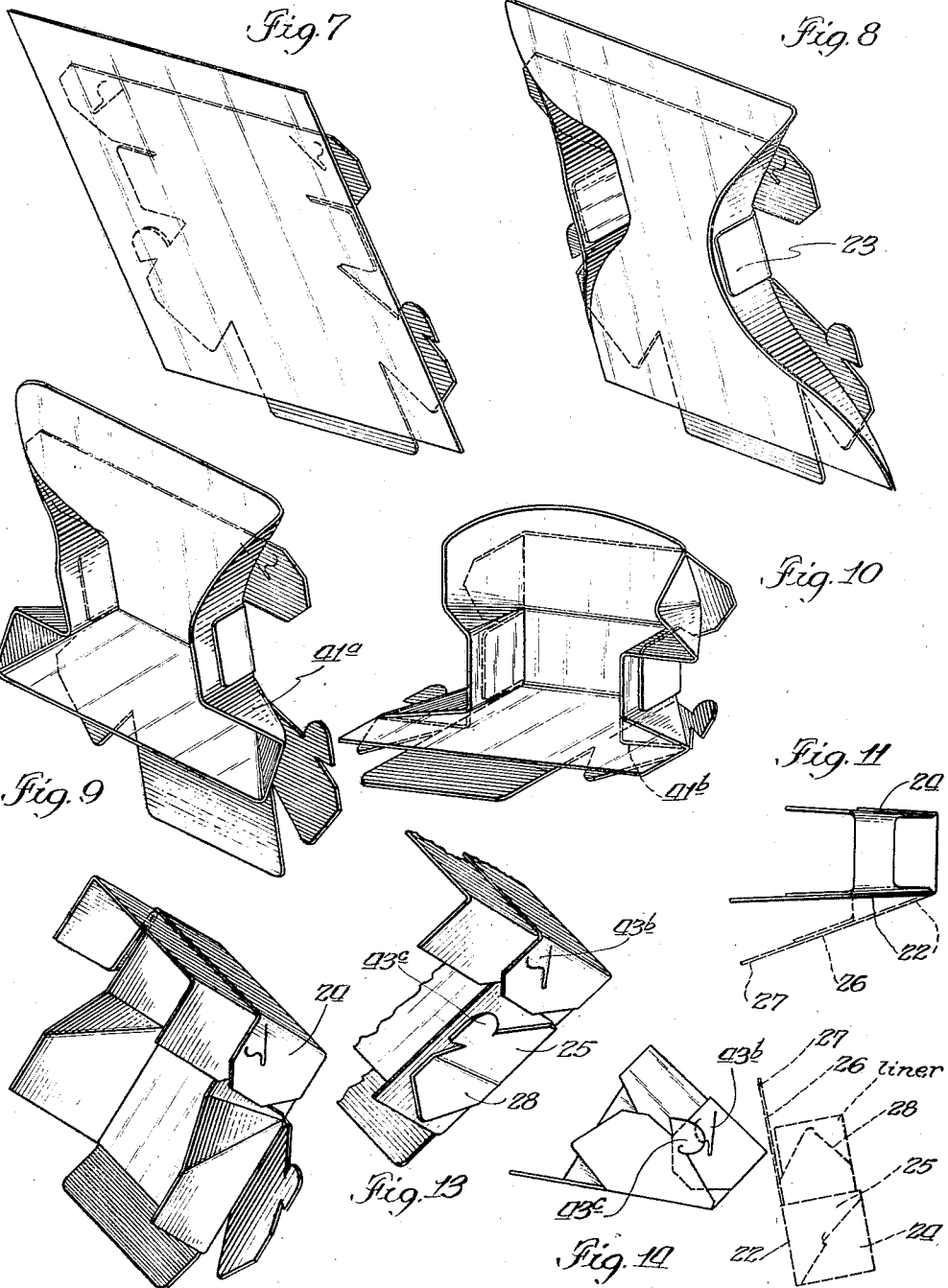


Fig. 12

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UNITED STATES PATENT OFFICE

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CARTON FORMING AND LINING MACHINE

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17 Claims. (Cl. 93—36.01)

This invention relates to machines for forming foldable blanks into open cartons of the type adapted to be filled with butter, cheese and like products, the carton being lined in the process of formation, and one object is to provide a machine with a minimum of parts for this purpose which accomplishes the operations entering into the formation and lining of the carton.

10 A further object of the invention is to employ only such instrumentalities in the novel machine as are immediately involved or concerned in accomplishing the steps to impart the required form to the liner and carton.

15 A still further object of the invention is to design the novel machine on lines of exceeding simplicity, from the view-points of construction, operation and attention.

20 Another object of the invention is to construct the novel machine on a rotary rather than reciprocating principle, whereby to secure continuity of motion, and facility to take up the work in more rapid sequence and thus have a greater output.

25 An additional object of the invention is to employ stationary formative elements for the most part, assuring definition and positive action, as well as freedom from complications.

30 With the above objects in view, and any others which may suggest themselves from the description to follow, a better understanding of the invention may be had by reference to the accompanying drawings, in which—

35 Fig. 1 is a side elevation of the novel machine; Fig. 2 is an end view from the right-hand side of Fig. 1;

Fig. 3 is a top plan view;

Fig. 4 is a perspective view of a feed chute for feeding blanks to the folding mechanism;

40 Fig. 5 is a plan view of an unfolded carton blank;

Fig. 6 is a plan view of a liner for the same; and

45 Figs. 7 to 14 are views in perspective and side elevation showing the steps in the progress of the carton and liner through the machine.

50 Cartons and liners of the type here considered are of conventional form both in the blank and folded state. Specific reference to the drawings shows a carton blank in Fig. 5, being cut on the full lines and adapted to be folded and/or creased on the dotted lines, and in the formation of the same to assume the shape of a carton or receptacle. The section 20 is considered as the bottom, 55 the section 21 as the front wall, the section 22 as the back wall, the sections 23 as upstanding wings, the sections 24 as end walls, and the sections 25 as locking wings. When the carton has been completed, its cover 26 and closing flap 27 rise directly from the back wall 22; and inner

tongues 28 extend directly upward from the locking wings 25. After the carton has been formed with a paper liner and filled with the commodity, the inner tongues 28 are folded down, the cover 26 is folded forward and the flap 27 is tucked into the front wall 21. It is the province of the present machine to engage a carton blank of the type shown in Fig. 5 and a liner blank of the type shown in Fig. 6 and impart a series of folding formations to both items simultaneously whereby to cause them to assume the final form of a completed open carton (Fig. 4). The liner blank does not come creased, but the dotted lines in Fig. 6 show where it becomes folded by the operation of the present machine.

15 Various types of machines have been developed in the past to produce the resulting carton anticipated above, but in most cases the structures were exceedingly complicated and involved various movable units to produce each folding action. Obviously, the instrumentalities for the driving and proper timing of such units were intricate, rendering the machine expensive to construct and difficult to attend and service. Moreover, the multiplicity and delicate nature of many parts made frequent adjustments and repairs necessary, and kept machines out of service for more or less time. Usually, the movements in handling the work were of a reciprocatory character, so that only the forward stroke took up the feed and the return stroke was lost motion. This not only represented lack of mechanical efficiency, but actually delayed the receiving factor of the machine, requiring the attendant or operator to be idle during the return period of the operating cycle. The present machine has therefore been designed to greatly simplify the mechanism as well as to take up the work more frequently than in machines of the past and so employ the attendant or operator to greater advantage.

40 The construction of the novel machine fundamentally involves a skeleton type of stand 30 having corner legs 30a and a base 30b. As viewed in Fig. 1, it is the intention that the attendant or operator stand at the rear of the machine, corresponding to the left-hand side of Fig. 1, and that the work proceed in a forward and rotary course through the folding stages and be discharged from the front end of the machine. For this purpose, the stand 30 is formed with pendent side bearings 30c to journal a cross-shaft 31. One end of this shaft carries a pulley 31a from which a belt 31b extends rearwardly to the speed reducer 32 of an electric motor 33. The shaft 31 carries a disk 31c in the center to which are attached the inner ends of a set of spider arms 34. These are shown in an equidistant set of four, but it is understood that the number of these arms may be varied if the requirements of

the machine so dictate. The spider is intended to be driven in the direction of the arrows indicated in Fig. 1, and each arm 34 terminates with a re-entrant bend 35 which serves as a forming block or pattern upon which the carton and liner blanks are to be folded. It is now apparent that, as the spider rotates, each forming block 35 successively takes part in the formation of a carton, and that the feed of the blanks follows the order in which the forming blocks assume operative positions.

A pair of laterally-spaced standards are erected upon the stand 30 at a central point, the standards 36 being joined at the top by a cross-bar 36. The standards form supports by means of inward spacers 36b for the side pieces 37 of a part-circular frame positioned alongside the path of travel of the forming blocks 35.

In order that the carton and liner blanks may be placed in the proper position to receive the forming blocks 35, a feeding chute 40 more clearly illustrated in Fig. 4 is provided. It is seen that the chute 40 is provided with sides 40a from which brackets 40b and 40c extend to support the chute inclinedly upon the stand 30. The upper level of the chute is represented at 40, while a plate 40d forms the lower level. The upper plate has side guard moldings 40e, and the lower one is bent up with side guards 40f. The upper plate is at a sharper angle, whereby to provide a space between the two levels, closed on the left-hand side of the operator by a wall 40g. On the right-hand side, the chute plates 40 and 40d respectively are extended with flared wings 40h and 40i; and at their bottom limits they are formed with laterally-spaced end flanges 40j. Thus, the attendant may take a carton blank of the type shown in Fig. 5 with the left hand and deposit it on the upper chute level between the guard moldings 40e, while inserting a liner sheet of the type shown in Fig. 6 between the wings 40h and 40i with his right hand, so as to deposit the sheet on the lower chute level. Both items will slide down to the limit of the end flanges 40j, so as to appear from the operator's viewpoint as in Fig. 7.

The chute 40 is provided with an opening 40k in its lower portion to almost fully expose the liner blank; and the lower plate 40d has a smaller opening 40m in the rotary path of the forming blocks 35. The advance of one of these blocks as indicated in Figs. 1 and 4 will push the liner and carton blanks forward into the arcuate frame 37. The entrance to the latter is in the form of outwardly flared cams 23a, and the radial distance of the frame 37 from the center of the forming block rotor is such that the cams 23a will force the wings 23 of the carton blank and the corresponding portions of the liner blank back along the sides of the block 35, whereby to impart the formation indicated in Fig. 8 to the carton and liner blank assembly.

The progress of the forming block under consideration carries the work forward without change until a pair of external and pendent cams 41 are met by the medial portions of the lateral liner folds, whereby to crease them and form the corner sections indicated at 41a in Fig. 9. These sections are accentuated as indicated by dotted lines in 41b of Fig. 10 as they enter upon a pair of arcuate cams 22a below the frame 37 and under a pair of short inclined cams 41c, the upper portion of the carton and liner blank assembly at the same time entering under a medial arcuate cam 21a above the frame, the cams 22a,

21a and 41c being bolted or otherwise secured to the arched standard 36. The further progress of the forming block thus causes the cams 22a and 21a to press rearwardly upon the sections 22 and 21, respectively of the carton blank, the corresponding portions of the liner blank also folding with the sections aforesaid upon the bottom and top of the forming block, so that the work assembly appears as per full lines in Fig. 11, the province of the cams 41c being to firmly double the lateral folds 41a of the liner.

The cam 21a continues in the form of a circular band 21b over the frame and down into the stand, but the cams 22a terminate within the zone of the posts 36, so that when the carton assembly passes the latter, the sections 22, 26, 27, 25 and 28, which are in a single plane, drop to an inclined position, as indicated by dotted lines in Fig. 11, the terminal edge of the section 27 resting on the inner portions of twin platforms 42 erected on the stand 30. When this has occurred, the forming block has advanced to a point where the end wall sections 24 meet a pair of cams 24a carried by the band 21b. These cams are sharply inclined from the outer edges of the band and have the effect of folding the sections 24 down as indicated in Fig. 12, the corresponding portions of the liner following suit in the direction of the sides of the forming block. At the same time, the wings 25, 28 meet a pair of flaring cams 25a mounted on the sides of the platforms 42, these cams having the effect of folding the sections 25, 28 almost at right angles to their former positions, so as to appear slightly outward from the wall sections 24, as illustrated in Fig. 13.

The progress of the forming block now causes the wall sections 24 to enter between the peripheries of a pair of rollers 43. These are mounted on the upper ends of a pair of shafts 44 which rotate in upper bearings 45 and lower bearings 46. The bearings 45 are carried by brackets 45a mounted on the stand, while the bearings 46 are carried by brackets 46a beneath the top of the stand. The lower ends of the shafts 44 carry bevel pinions 47 making connection with bevel gears 48 carried by the cross-shaft 31, so that the shafts are caused to rotate in opposite directions. These directions are such as to cause the inner portions of the roller peripheries 43 to move in the direction of the forming blocks; also, the shafts are geared to impart the same rate of surface speed to the rollers 43 as that of travel of the forming blocks. Each roller 43 is formed on its periphery with a rounded projection 43a, and the timing of the rollers is such that when the folded sections 24 of the carton formation enter between the rollers, each projection 43a will meet and impinge upon the slitted tab 43b of each section 24. This action is positive and succeeds in deflecting the tab whether the slitting is complete or imperfect, so that the deflection and opening of the tab is assured. In the meantime, the pendent portion of the carton indicated by dotted lines in Fig. 11 has been raised on the platforms 42 by the arcuate decline of the carton travel, so that the assembly now appears as in Fig. 14, each tongue 43c of the locking wing 25 partly covering the deflected tab 43b.

The progress of the forming block between the rollers 43 approaches the point where the platforms 42 assume a sharp downward curve 42a. This causes the sections resting on the platforms to swing in clockwise direction, advancing the tongues 43c into the openings formed by the 75

slitted tabs 43b to the extent of locking the ends of the carton and imparting the completed open position to the same as indicated by dotted lines in the right-hand portion of Fig. 14. It is understood that the liner blank has by this time followed the formations of the carton sections to assume the shape of an inner open receptacle surmounting the forming block. The further progress of the latter brings it to a substantially vertical position and at this time a wide plunger 50 having its rods 50a slidable in the lower end of the forming block drops by gravity from the same, automatically pushing the assembly of the carton and liner off the forming block to fall into a suitable receptacle placed below. The plunger rods 50a have internal enlargements 50b to serve as retainers when the plunger has emerged a suitable distance; and, when the rotor has made further progress, the particular forming block will also change its angle to the extent that its plunger 50 slides back and becomes a part of the forming block when the latter is again in a position to assume a forming operation.

It will be evident from the above description that the novel machine has many advantages over apparatus used for the same purpose in the past. First, the novel machine is exceedingly simple, having only such parts as are indispensable to its operation. Second, the machine has only two motive units, namely the forming block assembly and the locking rollers, all other parts entering into the formation of the work being stationary. Consequently, a low powered motor—usually $\frac{1}{2}$ H. P.—is sufficient for the motive power. This feature also renders the machine safer in operation as the motor would stop if any object interfered with or became caught in the mechanism. Third, all the vital operations, namely, forming, locking and stripping are positive, assuring uniformity in timing and effect. Fourth, the instrumentalities entering into the folding operations complete the actions prescribed for them, whereby to give the carton its ultimate form and seat the liner closely and squarely in the walls of the carton. Further, the instrumentalities referred to, being stationary and devoid of mechanical movements will not get out of adjustment. Further, the simplicity and skeleton construction of the machine make it relatively light and easily portable. Further, the absence of reciprocatory or multidirectional movements preclude the presence of vibration and strain or deforming stresses in the framework, so that the machine need not be bolted down to the floor and is truly portable. Further, the machine departs from prior practice by employing a continuous forward action, with operations in rapid sequence. Thus, no lost motion is involved, and the machine is capable of receiving and treating the blanks as fast as the attendant can deposit them into the chute. Further, the feed of the carton and liner blanks in close relation and within the exact limits of the chute insures the proper alinement of the blanks and their natural position of inclination for engagement by the forming blocks, this construction eliminating the errors and failures due in previous machines to critical feed requirements. Further, the feed is by gravity on the deposit of the blanks, and the independent feed channels allow liner blanks of different sizes and shapes relative to the carton blanks to be deposited in the feed. Further, the positive opening of the slitted tabs in the ends of the carton is assured whether the slitting or die cutting of the opening has or has not been done

properly by the manufacturer of the carton blank, the rotation of the locking rollers at the same surface speed as the progress of the forming block enabling the opening to be done without causing a drag on the carton. This positive action enables the use of cartons having a straight slit rather than those with what is commonly known as window openings, the novel method overcoming the greater resistance offered by the slit-type of carton. Further, the unit for stripping the carton and liner from the forming blocks is both simple and conformable to the revoluble system of forming blocks present in the novel machine. This system is an important departure from the viewpoint of the stripping operation, as in machines with vertically-operated blocks the retraction of the stripper by gravity is not possible; and in chain-type machines gravity would cause the thrust of the stripper prior to the impact of the block with the carton, spoiling the latter. Our strippers are internal, operate evenly and freely, require no power or timing connection, and do not subject the carton to the deforming or weakening influences possible to be imparted by the engaging action of an external or driven stripper. Further, the continuous progress of the work as each forming operation is applied lends freedom to each action and eliminates hardships and consequent defects in the work. Finally, the rotary principle of the machine renders it rapid, free of vibration, and quiet in operation:

We claim:

1. In a carton forming machine, a forming block for the blank, means to revolve the block about a horizontal axis, units along the upper course of the block movement to apply and form the blank into carton shape upon the block, a separate plunger in the advancing end of the block, and slide means connecting the plunger with the block whereby to permit the plunger to drop by gravity and strip the carton from the block when the latter assumes a descending course and to restore the plunger on the consequent rising movement of the block.

2. In a carton forming machine, including means to receive a carton blank with co-operative locking formations, a forming block movable to advance the blank in a continuous course, stationary units along said course to form the blank into carton shape upon the block; rotary units engageable with certain of said locking formations for adapting the same for interlocking engagement with the remainder of said formations.

3. In a carton forming machine, including a forming block for advancing a blank unit composed of carton and liner plies in advancing order, the carton ply having foldable lateral sections within the area of the liner ply, a channel in the path of the block and having side walls at the height of said sections, portions flared from said walls at the channel entrance to deflect said sections and corresponding parts of the liner ply on the progress of the block and cause said walls to fold such sections and said liner parts upon the sides of the block, the liner-ply continuations below said liner parts extending outwardly; and stationary cams depending from the outer sides of said walls to create outwardly-facing angle folds between said liner-ply parts and continuations thereof on the further progress of the block.

4. The structure of claim 3, bottom rest elements outwardly of the channel walls for said angle folds, and presser cams over said rest elements and inclined forwardly to positions close

thereto, the further progress of the block causing said presser cams to sharply fold said liner-ply continuations upon corresponding liner-ply portions therebelow and accentuate said angle folds.

5. In a carton forming machine, a forming block for advancing a carton blank having at least carton top, frontal and side forming sections folded on the corresponding faces of the block and a pendent extension of the frontal section, said extension having side-wings folded back in proximity to the planes of said folded side sections, the latter having slitted tabs and the side-wings having hook-projections, supports on which said pendent extension is slidable during the progress of the block, continuations of the supports being outwardly inclined and approaching the path of the block's travel and being effective to swing said extension upwardly and advance said hook-projections upon the slitted tabs, and rotary means to open the latter on the further progress of the block and stationary means to procure the interlocking of said projections and tabs on the further progress of said block.

6. The structure of claim 5, said rotary means comprising rollers with opposite peripheral portions alongside the path of the block, means to rotate the rollers at surface speeds equal to that of the block, and peripheral formations carried by the rollers and procuring said openings of the slitted tabs by inward pressure thereon.

7. In a carton forming and lining machine, including means for forming a lined carton; a feed unit for feeding carton and liner blanks to said machine simultaneously, said unit comprising a feed channel for liner blanks, a separate and superimposed feed channel for carton blanks, and said channels converging to form a terminal for positioning a liner and carton blank in superimposed relation for simultaneous feeding of the twain to said machine.

8. In a carton forming and lining machine, including means for forming a lined carton; a feed unit for feeding carton and liner blanks to said machine simultaneously, said unit comprising a feed channel for liner blanks, a separate and superimposed feed channel for carton blanks, said feed channels converging to form a terminal for positioning a liner and a carton blank in superimposed relation for simultaneous feeding of the twain to said machine, and said feed channels being downwardly inclined to feed said blanks to said terminal by gravity.

9. The structure of claim 8, a floor for the lowermost of said channels, and a floor for said terminal comprising a continuation of said floor of said lowermost channel.

10. In a carton forming and lining machine, including means for forming a lined carton; a feed unit for feeding carton and liner blanks to said machine simultaneously, said unit comprising a feed channel for liner blanks, a separate and superimposed feed channel for carton blanks, and terminal means for positioning a liner and carton blank in superimposed relation for simultaneous feeding of the twain to said machine, said feed channels being downwardly inclined to feed said blanks to said terminal by gravity, the angles of inclination of said channels being different, said terminal comprising a continuation of the lowermost channel, and said upper channel converging with said lower channel at the upper end of said terminal.

11. The structure of claim 7, and said terminal

being formed to provide a recess for facilitating the feed of said superimposed blanks to said machine.

12. In a carton forming machine including rotary forming blocks for successively and continuously engaging carton blanks and acting as impellers to advance the same past stationary means for forming said blank into a carton; an arcuate channel entirely above the horizontal plane of the axis of said impellers, said channel housing said stationary means, and said forming blocks including gravity operated strippers for stripping the completed carton therefrom after the passage of said forming blocks through said channel.

13. In a carton forming machine for forming cartons having hook-tapped end sections adapted to be inserted into locked engagement with slit and complementary end sections; rotary means for engaging said last named complementary sections and opening the slits thereof to permit the entry and locking of said hooked tabs therein.

14. In a carton forming machine for forming cartons having hook-tapped end sections adapted to be inserted into locked engagement with slit and complementary end sections, and including rotary forming blocks for successively and continuously engaging carton blanks and acting as impellers to advance the same past stationary means for forming said blank into a carton; an upwardly arched arcuate channel entirely above a horizontal plane through the axis of said forming blocks, said channel housing said stationary means, and rotary means adjacent the discharge end of said channel for engaging said last named complementary sections and opening the slits thereof to permit the entry and locking of said hooked tabs therein.

15. The structure of claim 14, said rotary means being rotated in the same surface direction as said forming blocks and at a surface speed corresponding to that of said forming blocks.

16. In a carton forming machine including a forming block for advancing a carton blank having lateral, top and bottom sections folded respectively upon the sides, top and bottom of the block, the top sections of the blank having outward and foldable side-wall extensions and foldable side wings below said extensions, a channel in the path of the block and having thin side walls along said folded lateral sections; side cams deflected downwardly from the top of the channel, cams below said channel, said last named cams and said side cams being simultaneously operative on the progress of the block to fold said extensions and side wings down to lie substantially in the plane of said channel side walls.

17. In a carton forming machine including a forming block for advancing a carton blank having carton side, top and bottom forming sections folded respectively upon the sides, tops and bottom forming portions of the block, said top forming section of said blank having outward and foldable side wall extensions and foldable side wings below said extensions, and said machine having a channel in the path of the block and having thin side walls engaging said folded side sections of said blank; cams on said machine below said channel and operative during the progress of said block through said channel to fold said side wings of said blank back into proximity to the planes of said folded extensions.

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