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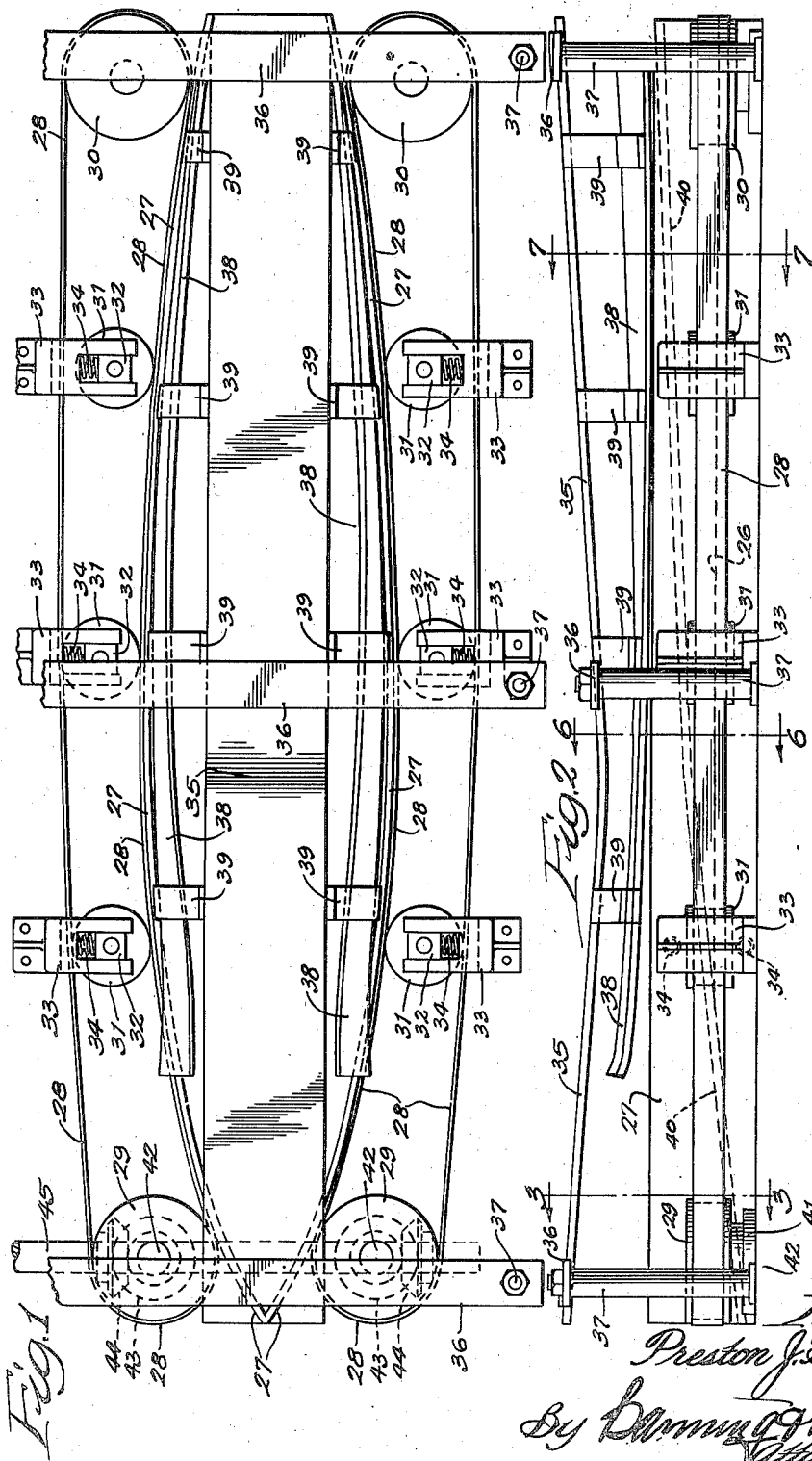
P. J. BLACKWELL

2,440,840

CARTON ERECTING APPARATUS

Filed March 24, 1945

3 Sheets-Sheet 1



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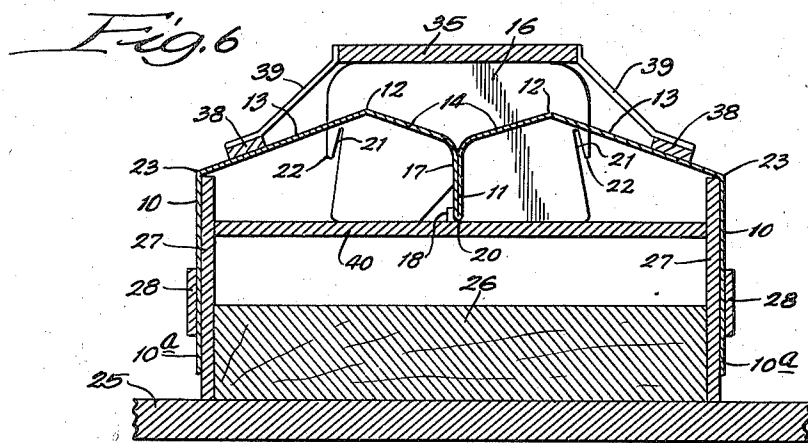
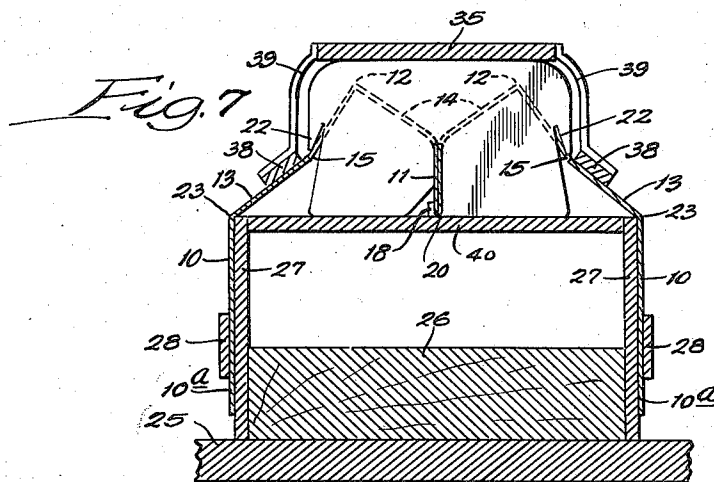
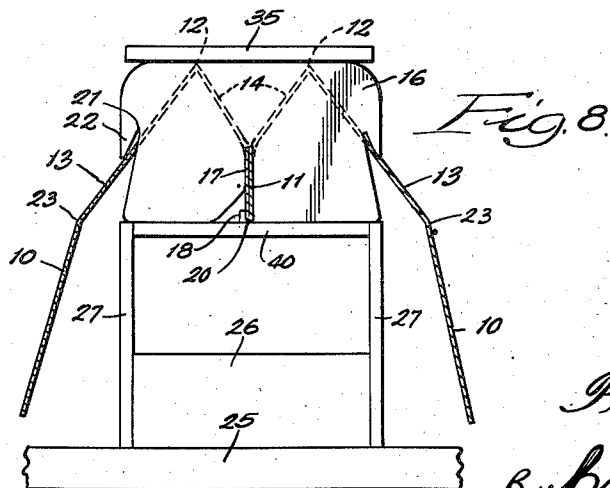
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UNITED STATES PATENT OFFICE

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CARTON ERECTING APPARATUS

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Application March 24, 1945, Serial No. 584,712

13 Claims. (Cl. 93—53)

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This invention relates particularly to the erection from a flat knock-down condition of a cellular carton of the type having cross partitions mounted in slots of the carton body walls, to an extended position in which notches at the ends of the partitions are interengaged with the ends of the body slots, thereby holding the side walls angularly open and the cellular compartments free for the reception of eggs or other articles.

Heretofore cartons of this nature have been erected by hand or by somewhat complicated machines for effecting the necessary operation. This invention relates to an improved simple type of apparatus in which the folded carton blanks are fed to and moved by engaging belts which carry the carton parts through the necessary operations and discharge them in erected condition. The carton itself may be formed from paper stock which is suitable for the purpose, and which is possessed of a certain degree of resiliency of which advantage is taken in providing a structure that affords adequate protection to the contained articles.

An important object of the invention is therefore to provide an apparatus utilizing a double belt feed which engages the blanks at places which become opposite walls and eventually covers of the carton, and for advancing the blank continuously to spread the walls, to set and interlock the cross partitions with the body walls, and to deliver the erected cartons from the opposite ends of the belts.

A further object of the invention is to provide fixed guides and supports in association with the belts so that the carton blanks with associated partitions are moved continuously through the various stages and operations without requiring other timing and operational parts which are complicated and likely to get out of order.

Other objects of the invention will appear in the specification and will be apparent from the accompanying drawings, in which:

Fig. 1 is a top plan view of a carton erecting apparatus in accordance with this invention;

Fig. 2 is a side elevation of the apparatus shown in Fig. 1;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2, showing the condition of the carton blank and partitions at this location;

Fig. 4 is a perspective view of a carton blank triple-folded to provide four plies between the inner two of which the partitions are disposed in flatwise relation, the center fold being uppermost as in the position when the blank is to be erected by the apparatus of this invention;

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Fig. 5 is a perspective view of the carton erected from the blank of Fig. 4, the carton walls being extended upwardly as when ready for reception or removal of contents;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 2, showing the condition of a carton blank and partitions at this location;

Fig. 7 which is a sectional view taken on line 7—7 of Fig. 2, shows the condition of the carton blank and partitions at this location; and

Fig. 8 is an end view of the apparatus showing the erected carton in inverted position, ready to be discharged from the apparatus.

Cellular cartons of the type to which this invention relates comprise a slotted blank having three parallel folds, one in the center which is opposite the others, together with a plurality of partitions, one entered through registering slots in the two inner plies of the blank so folded. In this condition, with the partitions lying flatwise between the outer plies of the blank, the blanks occupy the minimum space for shipment and storing. To use the cartons, they must first be set up or erected by opening the outer and inner plies of the blank.

In this operation a condition of distension is reached whereupon the partitions swing to transverse positions where they may be engaged and locked at their ends within registering slots provided for this purpose. This erection is a laborious task if done by hand as each partition must be engaged with its particular slot.

The present invention is concerned with a simple type of carton erector in which flat, folded cartons may be fed into one end of the apparatus where they are engaged and moved along by belts which advance the cartons processionaly to perform in succession the operations of opening out or spreading the several plies of the blank, rotating the cross partitions to transverse engaging positions, successively interengaging each cross partition with the corresponding slots in the sides of the blank, advancing the carton blank along until all of the cross partitions are engaged, and then discharging the carton in a completely erected condition.

Referring now more particularly to the drawings, the invention may be more easily understood from a consideration of the flat and erected cartons as shown in Figs. 4 and 5. Each carton blank is center folded at 20 and then folded twice again at 12 to provide two inner plies 11 between outer plies 13, the latter being formed with fold lines 23 which, in the erected carton, define cover sections 10. A blank so formed and folded is adapted to be opened out and distended but, with

the inner plies 11 partly restrained from separation by means hereinafter noted, spreading movement therebetween will be confined to those portions 14 which are furthest removed from the center fold (see Fig. 5). The inner and outer plies of the blank are formed with registering slots 15 so that transverse partitions 16 having slots 17 may initially be mounted in the slots 15 of the inner plies for hinging movement so as to be foldable flatly on opposite sides thereof when the carton blank is triple-folded or collapsed as shown in Fig. 4.

The slot 17 formed in the upper edge of each partition adapts it for seating within the inner plies of the blank, and at the top edge of each partition is a locking projection 18 adapted to be seated in one of a plurality of notches 19 formed along the center fold 20, thereby holding each partition in place with respect to the carton blank initially and to the erected carton structure eventually.

In each end of each partition is a notch 21 adapted to engage the outer end of the corresponding slot 15 of the outer ply 13 which later becomes one of the side walls of the erected carton, the resiliency of these walls being such that each must be sprung over the projection 22 at the outer end of the notch to seat the side wall therein, the carton being then supported or maintained in its extended or erected condition, as shown in Fig. 5. In the side walls are parallel longitudinal scores or fold lines 23 and 24 defining the carton covers 10 and flaps 10a therefor.

The apparatus provided by this invention for erecting these cartons comprises a supporting base 25 having a longitudinal spacing strip 26 mounted thereon to which side guides 27 are secured at each side thereof. As shown more clearly in Fig. 1, these guides 27 approach each other rather closely at the starting end of the apparatus. They round out gradually therefrom to approximately the longitudinal center of the apparatus and then they gradually curve inwardly toward each other, but are spaced apart at the rear or discharge end.

Mounted alongside of each guide 27, here shown at the outer side thereof, is an endless belt 28 rotatable upon end pulleys 29 and 30 arranged close to the guides so that the inner run of the belt tends to engage therewith. Intermediate the end pulleys are tension idlers 31 each mounted in a block 32, slidably mounted in a guide block 33, secured to the supporting base 25 and having a spring 34 tending to press the block 32 so that the idler will engage the inner side of that run of the belt which engages the guide 27, tending to hold the belt more tightly against the guide. The outer free run of the belt may extend through the guide blocks 33 at the rear of the idlers 31.

Extending over the guides 27 and longitudinally thereof is a top guide plate 35 mounted upon cross pieces 36 supported at the ends by standards 37 erected upon the supporting base 25 beyond the outer sides of the belts 28. This top guide is coextensive with the side guides 27; it is high at the initial or starting end of the apparatus and inclines slightly downward therefrom to a point in advance of the longitudinal center of the apparatus from whence it inclines gradually upward toward the other or discharge end of the apparatus as shown more clearly in Fig. 2.

Also located at the sides of the apparatus and relatively between the upper ends of the side guides 27 and the side edges of the top plate guide 35 are flat engaging deflecting bars 38

which are bowed endwise in general conformity with the curvature of the guides 27. Each bar is supported from the adjacent edge of the top plate by a number of brackets 39 adapted to hold the deflecting bars 38 in a slightly inclined position at the starting end, the bars lying nearly horizontally toward the starting end of the apparatus (see Fig. 6) and then twisting gradually until they approach a vertical position (see Fig. 7). The upper edge of each bar is disposed substantially parallel to the rearward upwardly inclined portion of the top rail 35 (see Fig. 2).

The starting ends of the deflecting bars 38 are shown as commencing at a point spaced from the starting end of the apparatus, and at a point where the guides 27 are nearly but not quite at their maximum separation. The reason for this is that the deflecting bars 38 do not come into operation until after the outer plies of a carton blank have been opened and separated by the operation of the belts 28 and the guides 27.

A bottom support 40 which is also provided for the cartons extends longitudinally of the apparatus, and preferably inclines upwardly from the starting to the discharge end. The inclination for the first part is slightly greater than the inclination for the latter portion, starting near the bottom of the guides 27 and terminating at the top of these guides as clearly shown in Figs. 7 and 8.

To operate the driving belts, each of the pulleys 29 is rotatably mounted in a bearing 41 mounted on top of the supporting base 25 by means of a shaft 42 which carries a bevel gear 43 at its lower end below the base 25. Both of the gears 43 are engaged by corresponding bevel gears 44 mounted upon a common driving shaft 45 supported by bearings 46. The direction of driving is such that the inner run of each belt is moved along its corresponding guide 27 from a point adjacent the front or starting end thereof, and is held in close contact therewith by the spring pressed idlers 31 to a point adjacent the rear or discharge end of the guide.

Operation

In operation, a flatly folded carton blank as shown in Fig. 4 is first inverted, that is, with the free edges at opposite ends downward, and is then placed at the starting end of the apparatus with the outer plies straddling the guide walls 27 (see Fig. 3). The side folds 12 then lie uppermost to be engaged by the upper guide plate 35 which exerts a downward pressure thereupon. When so positioned, the depending blank walls 10 will lie alongside the guide faces against which the endless belts are in pressure engagement, this engagement the moving belts being then transferred to the blank to produce an advance movement thereof lengthwise of the diverging guides 27.

The first action of the guides 27 is to spread apart the outer plies 13 of the carton blank, bending them along the preformed fold lines 23 whereby to separate the inner ply portions 14 as well. This produces a condition of distension which initially swings the cross partitions 16 upon their slot hinges to transverse positions wherein they are aligned with the registering slots 15 of the outer plies. A continued movement of the carton blank along the diverging guides and beneath the downwardly inclined portion of the top guide 35 will force the two folds 12 downwardly with the result that the cross partitions 16 register and advance through the slots 15 in the carton

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blank until the partition edges which then are uppermost become engaged by the under surface of the top guide 35, as shown more clearly in Fig. 6.

At a point between the position shown in Fig. 3 and Fig. 6, the deflecting bars 38 engage the outer plies 13 of the carton blank to depress them to a partially flattened position (see Fig. 6). Here the lowermost edges of the cross partitions are supported by the bottom support 40 which is inclined upwardly from the starting end.

As the partially erected carton is advanced further between the lower support 40 and the upper guide 35, the central part of the structure is gradually raised, but the deflecting bars 38, whose elevation above the guides 27 remain substantially unchanged, continue to engage the outer plies 13 and maintain the inner faces of their folds 23 in engagement with the tops of the guides 27, thereby forcing these plies inwardly to the point that the proximate ends of the slots 15 are positioned below the pointed extremities 22 of the notches 21. At this point, the spacing of the guides 27 and the positioning of the deflecting bars 38 is such that the partition and notches 21 may inter-engage and lock with the slotted outer plies 13 of the blank which now become the outer walls of the carton with the result that a self-sustaining structure is produced as shown in cross section in Fig. 8.

This setting-up operation causes all of the partitions to become engaged with the outer walls of the carton which, as thus erected, is then discharged from the exit end of the apparatus by the continued movement of the belts. The cartons which are made of a suitable fiber or paper board have sufficient resilience and flexibility to be moved continuously by the belts without breaking, and the blank plies are maintained yieldingly at all times against the guides 27. An apparatus of this kind is preferably three or four times the length of the cartons. No particular means is shown for feeding the folded blanks or for removing the erected cartons, these operations being optionally done by hand or mechanical means.

Although the invention has been described in considerable detail, it is not the intention to limit the invention to the mechanism shown, since variations therefrom are permissible without departing from the spirit and scope of the invention.

I claim:

1. An erecting apparatus for a flat folded carton having side walls with free edges extending substantially together and folded medially inward with transverse slots in the inner side walls extending into the medially folded portion and having cross partitions hingedly seated in the slots of the medially folded portion and lying flatwise between the side walls, guide means insertable between the free edges of a carton at one end rounded outwardly intermediate their ends and approaching each other at the other end, a belt extending along the outer face of each of the guide means, means to rotate the belts, spring pressed means along the inner run of each belt to press it against its guide means, the partitions being swung transversely of a carton when the side walls of the carton are moved outwardly by the guide means, means for supporting the upper and lower edges of the partitions when swung to transverse positions, and outer deflecting bars for engaging the outer face of the side walls of a carton to depress the side walls and engage the ends of the slots therein with the ends of

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the partitions as the cartons are moved along the guide means by the said belts.

2. A carton erector, comprising a pair of side guides close together at the starting end, diverging therefrom and gradually approaching each other at the discharge end, a pair of belts each engaging and extending along the outer face of one of the guides, means to yieldingly press the inner run of each belt against the outer face of its guide, upper and lower guide means for engaging the upper and lower edges of cross partitions as they are moved endwise of the side guides, and a pair of inclined outer deflecting bars extending from a substantially horizontal position near the starting end parallel with and within the side guides and turned into substantially vertical position at the discharge end.

3. In an apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, a pair of side guides arranged close together at the front end and rounded outwardly intermediate of their ends and spaced apart at their rear ends a distance less than the space between the outwardly rounded intermediate portions, a pair of pulleys adjacent each end of the side guides, a pair of belts extended between one pulley of each pair and engaging the outer faces of the guides and running lengthwise of the same and contacting with the guides throughout substantially the entire length of said guides to receive the free edges of outer plies of a flatly folded carton blank between the belts and the guides and thereby engage and move the carton blank lengthwise upon the guides to spread the outer plies and separate the inner plies and permit the cross partitions to swing transversely opposite registering slots in the plies, the rear portions of the guides causing the outer plies of the carton to move inwardly as the cross partitions are advanced into the slots, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

4. In an apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, a pair of side guides having vertical faces arranged close together at their front ends and rounded outwardly intermediate their ends and spaced apart at their rear ends a distance less than the distance between the outwardly rounded intermediate portions, a pair of pulleys adjacent each end of the side guides, a pair of belts extended between one pulley of each pair and engaging the vertical faces of the guides and running lengthwise thereof to receive the free edges of the outer plies of a flatly folded carton blank between the belts and the guides, thereby to engage and move the carton blank lengthwise upon the guides to spread the outer plies and separate the inner plies and permit the cross partitions to be arranged transversely of the carton opposite registering slots in the plies, the rear ends of the side guides causing the outer plies of the carton to move together as the cross partitions advance in said slots and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

5. A carton erecting machine for flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, comprising a pair of side guides arranged to spread the outer plies of the carton and cause separation of the inner plies and permit the cross partitions to be arranged transversely of the car-

ton opposite registering slots in the plies, a pair of pulleys adjacent each end of the side guides, a pair of endless belts extended between one pulley of each pair and engaging the outer faces of the side guides to receive said outer plies and thereby to engage and move the carton blank lengthwise upon the guides to effect said spreading of the outer plies and separation of the inner plies of the carton, a bottom guide arranged to form a support for the inner plies, and a top guide arranged to depress said plies and force the cross partitions into said slots, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

6. In an apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, comprising side guides extending close together at their front ends to receive free edges of certain of the plies at the outside of the guides, a pair of pulleys adjacent each end of the side guides, endless belts extended between one pulley of each pair and extending along the outer faces of the guides to engage the free edges of the blank plies and move the same along the guides, the guides being spaced apart intermediate their ends for spreading the engaged plies and separating the other plies and to permit the cross partitions to be arranged transversely of the carton, means engaging the blank plies at points above the guides to force the cross partitions into slots during advance of the blank, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

7. An apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, comprising a pair of side guides arranged to extend between the free edges of a folded carton at the front ends of the guides, the guides being rounded outwardly intermediate their ends and spaced apart at their rear ends a distance less than the space between the outwardly rounded intermediate portions, a pair of pulleys adjacent each end of the side guides, belts extended between one pulley of each pair and engaging the outer faces of the guides and extending lengthwise thereof to receive the free edges of the folded carton between the belts and the guides and thereby to move the carton lengthwise of the guides to spread the carton edges apart and to permit the partitions to swing transversely of the carton, means to engage the ends of the partitions with slots in the side walls of the carton, the rear portions of the guides moving the side walls inwardly as the partitions advance in said slots, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

8. An apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, comprising guides having their front ends close together and insertable between the free edges of a carton, said guides extending lengthwise of the apparatus and rounded outwardly intermediate their ends and spaced apart at their rear ends a distance less than the space between the outwardly rounded intermediate portions, means moving lengthwise of the guides and coacting with the inserted free edges of a carton to grip the carton free edges and spread them apart while advancing the carton lengthwise along the guides, said means operating also to spread the folded portions and permit the partitions to swing

transversely of the side walls, and means engaging the side walls for advancing the cross partitions into registering slots, the rear ends of the guides permitting the side walls to move together as the partitions are advanced into the slots.

9. An apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, comprising a pair of side guides arranged close together at the front end and rounded outwardly intermediate their ends and approaching each other at the rear end, a pair of pulleys adjacent each end of the side guides, belts extended between one pulley of each pair and engaging the outer faces of the guides and extending along the same to receive the free edges of a flatly folded carton between the belts and the guides and thereby to move the carton lengthwise to spread the edges apart and then move them together, upper and lower guide means for engaging the body walls and the upper and lower edges of the cross partitions for moving said partitions into engagement with the body walls as the carton is moved from one end to the other of the side guides by said belts, the rear portion of the said guides causing inward movement of the side walls as the partitions are moved into engagement with the same, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

10. An apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, comprising a pair of side guides arranged close together at their front ends and rounded outwardly at their intermediate portions and spaced apart at their rear ends a lesser distance than the space between the outwardly rounded intermediate portions, a pair of pulleys adjacent each end of the side guides, belts extended between one pulley of each pair and engaging the outer faces of the guides and extending along the same to receive the free edges of a flatly folded carton between the belts and the guides and thereby to move the carton lengthwise to spread the edges apart and permit the cross partitions to swing transversely of the carton into registry with slots in the side walls of the carton and then to move the side walls inwardly towards each other, longitudinally extending guiding means arranged to engage the upper and lower edges of the partitions to maintain the same in position for engaging said slots as the carton is moved along the guides and to insure engagement of the partitions with the slots when the side walls are moved inwardly toward each other, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

11. An apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, comprising a pair of side guides arranged close together at their front ends and rounded outwardly at their intermediate portions and approaching each other at their rear ends, a pair of pulleys adjacent each end of the side guides, belts extended between one pulley of each pair and engaging the outer faces of the guides and extending along the same to receive the free edges of a flatly folded carton between the belts and the guides and thereby to move the carton lengthwise to spread the edges apart and permit the cross partitions to swing transversely of the carton and then to move the side walls together at

the rear portions of the side guides, upper and lower longitudinally disposed guide means arranged to engage the upper and lower edges of the cross partitions for maintaining the same in position for engaging slots in the side walls of the carton, carton deflecting bars located between the side guides and the upper guide means and arranged in substantial parallelism with the side guiding means in position for engaging the carton for forcing the cross partitions into engagement with said slots, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

12. An apparatus for erecting flatly folded cartons composed of integral inner and outer plies and provided with hinged cross partitions, comprising a pair of side guides arranged close together at their front ends and rounded outwardly at their intermediate portions and approaching each other at their rear ends, a pair of pulleys adjacent each end of the side guides, belts extended between one pulley of each pair and engaging the outer faces of the guides and extending along the same to receive the free edges of a flatly folded carton between the belts and the guides and thereby to move the carton lengthwise to spread the edges apart and permit the cross partitions to swing transversely of the carton, and then to move the side walls together at the rear portions of the side guides, upper and lower longitudinally disposed guide means arranged to engage the upper and lower edges of the cross partitions for maintaining the same in position for engaging slots in the side walls of the carton, carton deflecting bars located between the upper edges of the side guides and the upper guide means and extending along the side guides in substantial parallelism with the same from the outwardly rounded portions thereof to approximately the rear ends of the side guides, and twisted from a substantially horizontal starting position to a gradually vertical finishing position to maintain their carton engaging faces in flush contact with the side walls of the carton for forcing the cross partitions into engagement with said slots, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

13. An apparatus for erecting flatly folded car-

tons composed of integral inner and outer plies and provided with hinged cross partitions, comprising a pair of side guides arranged close together at their front ends and rounded outwardly at their intermediate portions and approaching each other at their rear ends, a pair of pulleys adjacent each end of the side guides, belts extended between one pulley of each pair and engaging the outer faces of the guides and extending along the same to receive the free edges of a flatly folded carton between the belts and the guides and thereby to move the carton lengthwise to spread the edges apart and permit the cross partitions to swing transversely of the carton and then to move the side walls together at the rear portions of the side guides, upper and lower longitudinally disposed guide means arranged to engage the upper and lower edges of the cross partitions for maintaining the same in position for engaging slots in the side walls of the carton, carton deflecting bars located between the upper edges of the side guides and the upper partition guiding means, said deflecting bars extending approximately from the widest of the outwardly rounded portions of the side guides to the rear ends of the same and arranged to engage and depress the side walls of a carton as it is moved along the guides to force the slots of the side walls into engagement with the partitions, said deflecting bars being arranged in substantial parallelism with the adjacent portions of the side guides to effect the said engagement of the slots of the side walls with the cross partitions, and driving means interconnecting one pulley of each pair for causing the two belts to move in unison.

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