July 29, 1952 R. J. HICKIN ET AL 2,604,827

CARTON ERECTING MACHINE

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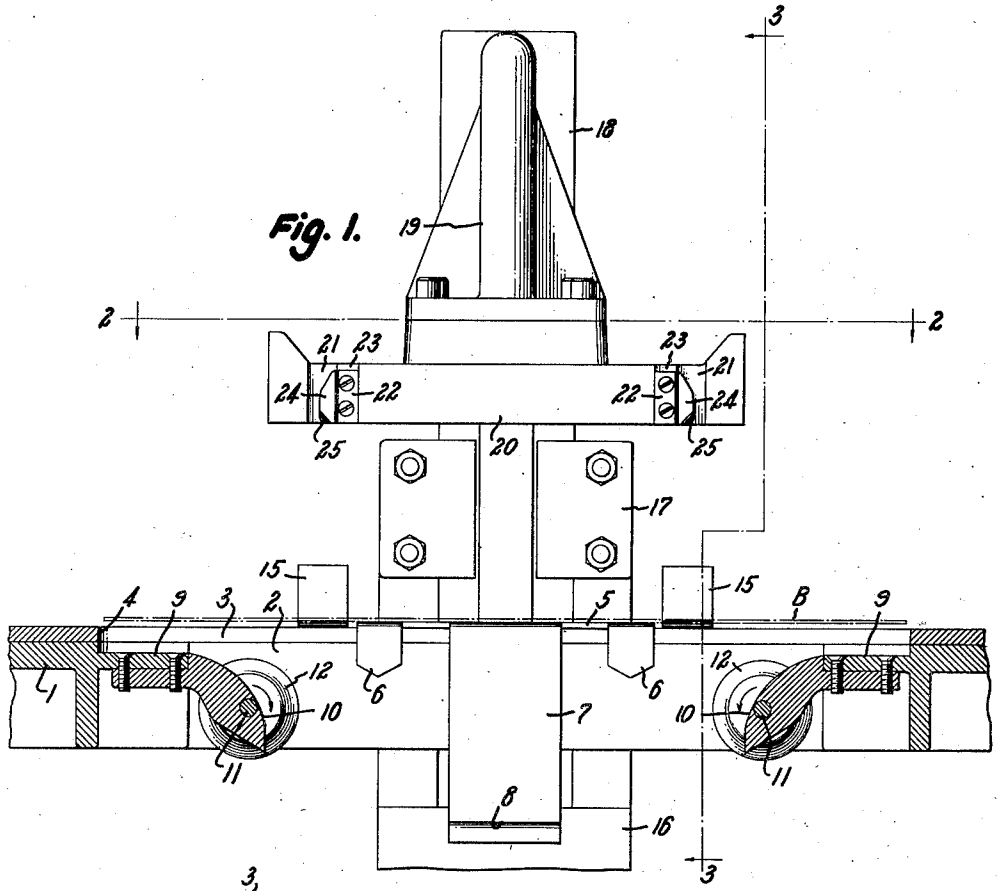
Fig. 1.



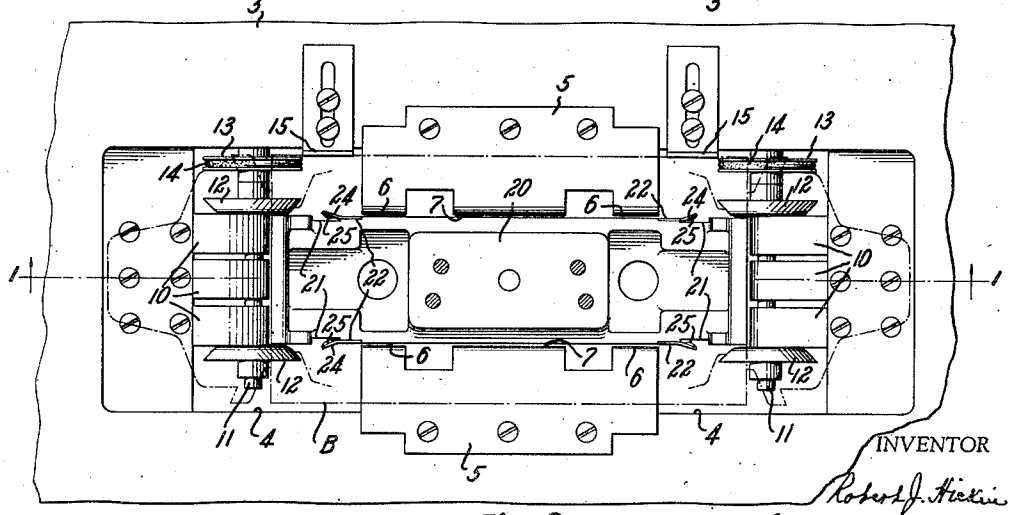


Fig. 2.

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Fig. 3.

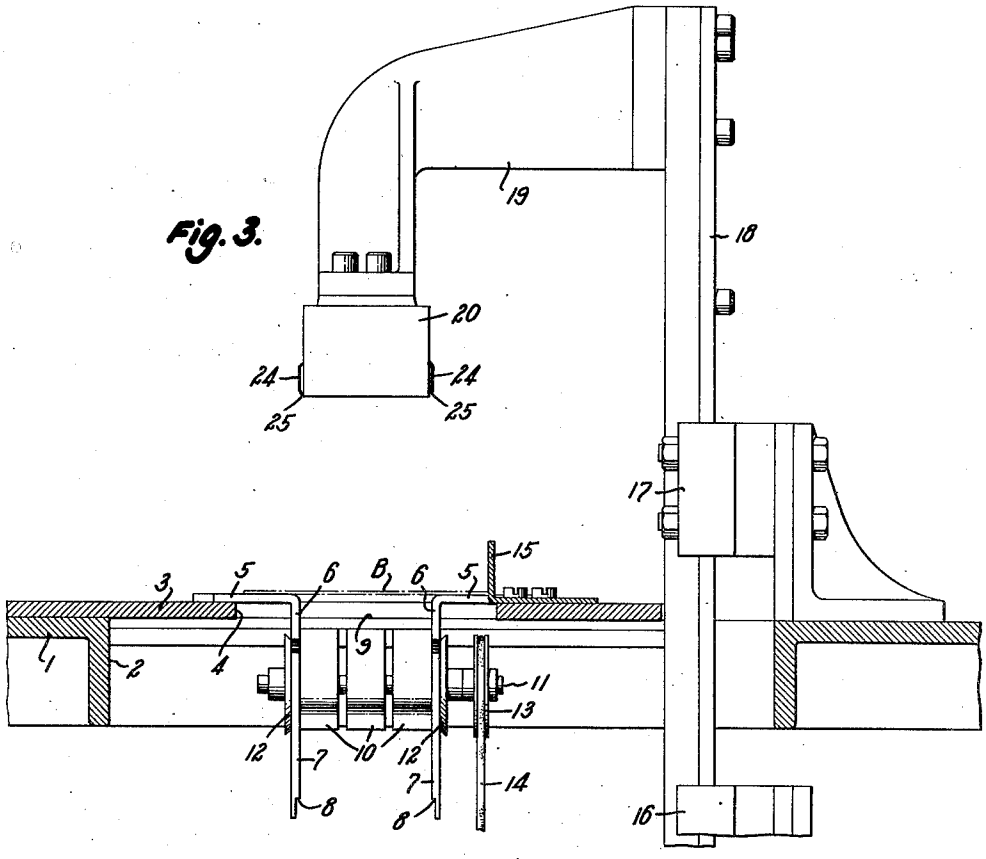

Fig. 4.

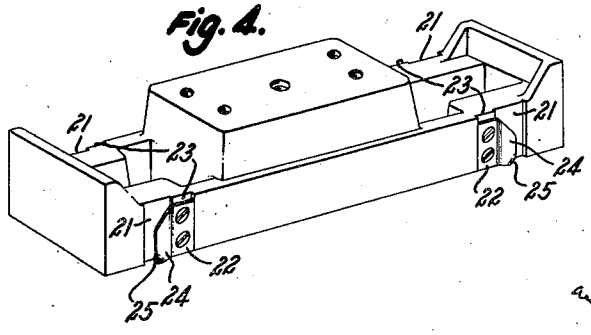

Fig. 5.

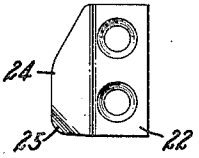

Fig. 6.

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Fig. 7.

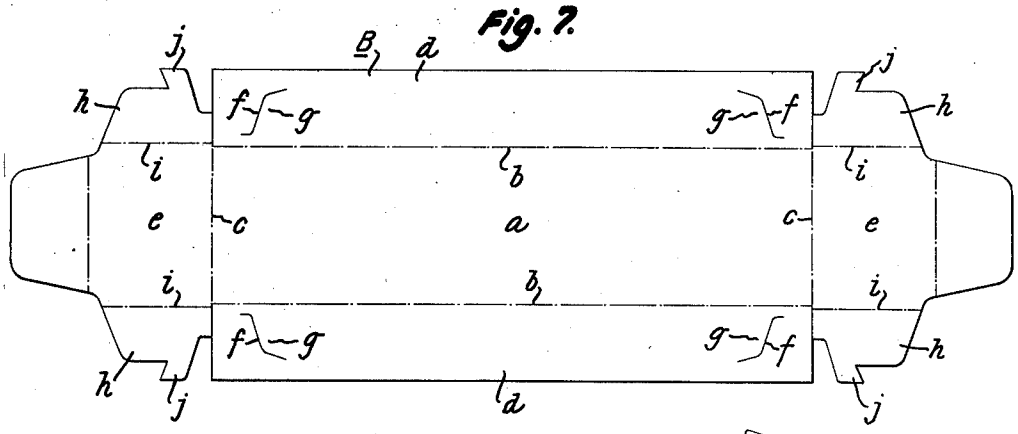


Fig. 8.

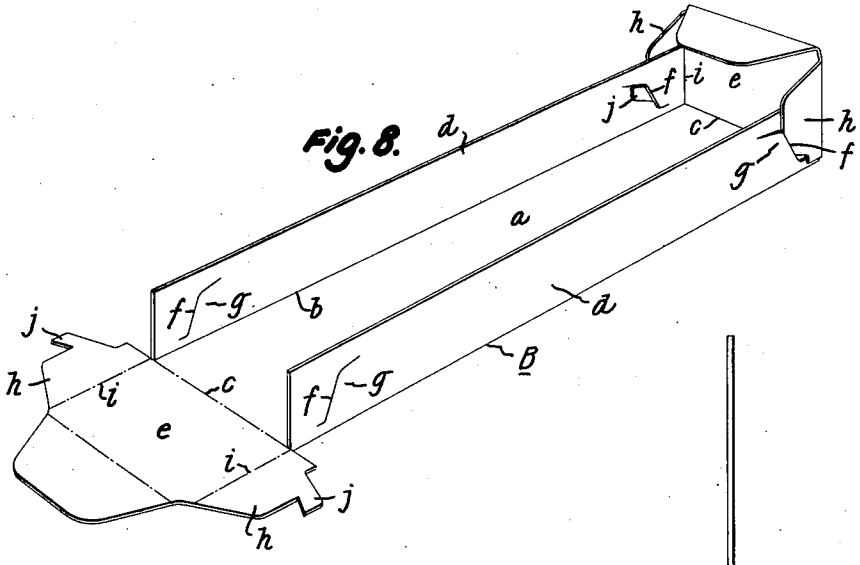


Fig. 9.

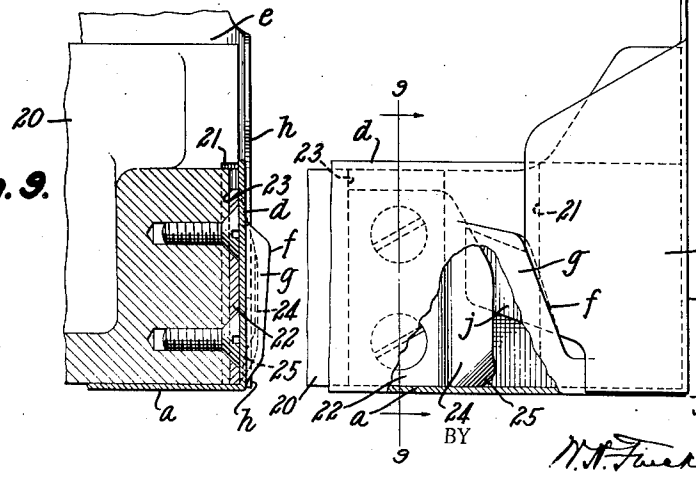
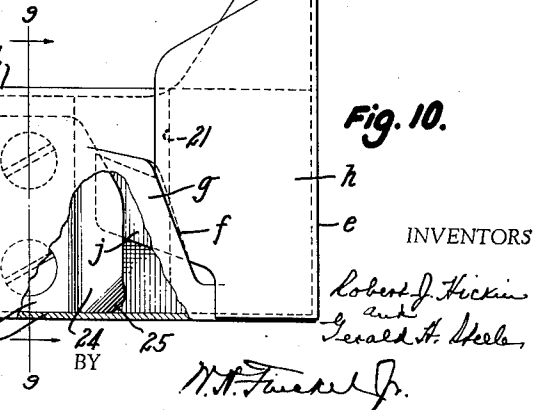


Fig. 10.



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UNITED STATES PATENT OFFICE

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CARTON ERECTING MACHINE

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Application April 17, 1950, Serial No. 156,284

3 Claims. (Cl. 93—51)

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This invention relates to apparatus to set-up, or erect, paperboard cartons into condition for use in the packaging of commodities, and it has particular reference to refinements in the mechanism of apparatus for erecting cartons of the corner-lock tray type.

In the erecting of such corner-lock cartons which include in cooperating side wall members at the corners a slit in one such member and a locking tongue or hook on the other such member complemental to such slit, a somewhat conventional series of operations, and form of apparatus, for raising the side wall members to a position substantially at right-angles to the bottom and for automatically inter-engaging the aforesaid corner locking means at the corners, is now in rather general use.

The apparatus includes, broadly, fixed die means and a reciprocable plunger cooperating with such die means, together with means for feeding carton blanks one at a time into position over the die means and, usually, conveyor means for transferring the cartons from beneath the die means after completion of the erecting or setting-up operation.

In the functioning of the die and plunger means during the setting-up operation, the following operative steps are performed. After a carton blank is fed to the die means and properly positioned thereover by its engagement with locating stops, the plunger descends and forces the bottom of the carton downwardly into the die with the result that the opposite side wall members provided with the slits of the corner locking means, and forming the carton sides, are erected at right-angles to the bottom and forced against the sides of the plunger.

As this operation progresses the other pair of side wall members having end flaps provided with the tongues or hooks, and forming the carton ends, are gradually turned upwardly with respect to the bottom, their end flaps folded into parallelism with and against the side walls and their tongues or hooks engaged with the slits. In order that the tongues or hooks may readily engage the slits the sides of the plunger are provided with means, usually projecting pins, against which the side walls are pressed and which cause portions adjacent to the slits to be forced outwardly thus opening the slits for reception of the tongues or hooks.

Upon completion of the downward stroke of the plunger the upper edges of the side walls of the carton will, due to their inherent resiliency, spring slightly outwardly so as to engage with stops which, when the plunger ascends upon its

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return stroke, will serve to strip the erected carton from the plunger and permit it to drop upon the conveyor for transfer away from the apparatus to a filling station or the like.

It sometimes happens that the tongues or hooks, although properly entered in the complemental slits, will not retain their intended engagement with the side walls to hold the end walls in locked, erected condition when the carton is stripped from the plunger, thus resulting in defective cartons, and it is the primary object of the present invention to provide means whereby this failure will be overcome and proper interengagement of the corner locking means insured.

A further object is to provide means for so causing, and directing, the upward folding of the end walls, and the relative bending or folding of their tongue or hook carrying end flaps, that improper folding and possible crushing and tearing of such end flaps, and of adjacent portions of the carton, will be eliminated.

The invention, having these objects particularly in view, comprises in combination with the reciprocable plunger of a carton erecting machine of substantially the type referred to, means for so operating upon the side walls of the carton to open the slits of the locking means as not only to make them properly receive the tongues or hooks but, when the erected carton is stripped from the plunger, to insure the proper, essential engagement of the hooks with complemental edges of the slits. And the invention comprises also rotatable guiding and bending elements included in the die means and serving to perform the desired bending of the end flaps of the end walls with a progressive wiping action whereby their improper folding and possible crushing and tearing are overcome, all as will be explained hereinafter more fully and finally claimed.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated,

Fig. 1 is a sectional side elevation, taken on the line 1—1, Fig. 2, of the plunger and die means of a carton erecting machine of the type referred to embodying refinements of parts in accordance with the invention,

Fig. 2 is a sectional plan view of the machine parts taken on the line 2—2, Fig. 1,

Fig. 3 is a sectional end elevation taken on the line 3—3, Fig. 1,

Fig. 4 is a perspective view of the machine plunger head, detached, showing the nature and arrangement thereon of the means for opening

the locking slits of the carton side walls and insuring proper final engagement of the locking tongues or hooks in accordance with the invention,

Figs. 5 and 6 are, respectively, a side elevation and a top edge view, somewhat enlarged, of the slit opening and tongue or hook engaging means,

Fig. 7 is an enlarged plan view of a blank of one accepted form of corner-lock carton for the erection of which the mechanism of the invention is well adapted,

Fig. 8 is a perspective view of the blank of Fig. 7 in partially erected condition to illustrate the functioning of the mechanism of the invention,

Fig. 9 is a greatly enlarged fragmentary end sectional elevation, taken on the line 9—9, Fig. 10, showing the plunger head in its operation upon a carton blank, and

Fig. 10 is a fragmentary side elevation of the parts shown in Fig. 9, with a portion of the carton side wall broken away.

As hereinbefore indicated, the carton erecting apparatus or machine to which the refinements of the invention are applied, and as shown generally in Figs. 1 to 3 of the drawings, is of known type.

The bed or table 1 of the machine (Figs. 1 to 3) is provided with a die receiving opening 2, or well, over which a bed plate 3 having an opening 4 of dimensions appropriated to the particular carton blank to be erected may be affixed. Attached to the bed plate 3 at each longitudinal edge of the opening 4 is a forming die member 5 having downwardly extending marginal and central guide members 6 and 7, respectively, adapted for imparting wiping contact to the side walls of the carton blank, and the central guide members 7 are provided at their lower ends with shoulders or stops 8 for engagement with the upper edges of the side walls of the erected cartons, as hereinbefore noted.

Attached to shelf members 9 of the frame 1 of the machine adjacent to the ends of the opening 2 are forming die members 10 adapted for wiping contact with the end walls of the carton blank, and these forming die members 10 carry shafts 11 upon which are mounted wiping disks 12 of frusto-conical form preferably rotatable with the shafts 11 in the direction of the arrows, Fig. 1, and which may be driven by pulley and belt mechanism 13, 14 from some source of power (not shown) of the machine. Alternatively, the disks 12 may be freely rotatable upon or with the shafts 11 under the influence of the parts of the carton blank with which they contact.

Gauging stops 15 adjustable with respect to the die opening 4 serve to properly position the successively fed carton blanks laterally of the opening and hence in proper operative relation to the sets of forming die members 6, 7, 10 and 12.

Mounted in slide bearings 16 and 17 of the frame or bed 1 of the machine is a plunger-carrying slide 18 provided with a laterally extending arm 19 to which is affixed the plunger head 20 in proper vertical register with the die forming members 6, 7, 10 and 12, and vertical reciprocation is imparted to the slide 18 and hence to the plunger head 20 by appropriate mechanism (not shown).

Referring to Figs. 7 and 8, it will be seen that the carton blank B, there shown as appropriate for erection by the machine disclosed, comprises a sheet of suitable paperboard material cut and scored to provide a bottom *a* bounded by folding scores *b*, *b* and *c*, *c* at its sides and ends, respectively, side wall members *d*, *d*, and end wall members *e*, *e*. The side wall members are provided with locking slits *f* adjacent to their ends and so formed (as shown of substantially S-shape) as to define distortable portions *g* in the side wall members. The end wall members *e* are furnished with lateral end flaps *h* foldable upon appropriate folding scores *i* relatively to the end wall members and having at their free lateral edges tongue or hook members *j* which, in combination with the locking slits *f* of the side wall members, provide the corner locks of the carton and serve to hold the side and end walls of the carton in proper set-up condition when erected.

Referring to Figs. 1 to 4, it will be apparent that the plunger head 20 is of a length and width equal to the length and width of the bottom *a* of the carton blank B (see the broken line showing of the carton blank, Fig. 2), and it will be understood that the cooperating faces of the wiping forming members 6, 7, 10 and 12 of the die are spaced from the respective sides and ends of the plunger head 20 (having reference to its path of vertical reciprocation) a distance substantially equal to the thickness of the paperboard material of which the carton blank is made. Therefore, when a carton blank is positioned over the die against the gauging stops 15, as indicated in broken lines, Fig. 2, descent of the plunger head will cause the side and end wall members to be folded upwardly against the sides of the plunger head and in intimate contact therewith.

Adjacent to the ends of its sides the plunger head 20 is provided with vertical recesses or grooves 21 normally lying in the zone of the distortable portions *g* of the carton side walls when the latter are folded or wiped upwardly by the guide members 6 and 7, and adjacent to and partlally overlying these recesses or grooves 21 are the corner lock guiding and associating means which form the primary feature of the present invention. These means comprise plates 22 secured to countersunk seats 23 in the sides of the plunger head so that they lie flush therewith, and provided with wings 24 bent laterally outwardly from the plane of the respective plunger head sides, the lower ends of these wings being provided with curved, laterally inturned lips 25 extending into the recesses or grooves 21 to a minor degree.

It will thus be seen, having reference particularly to Figs. 9 and 10, that when the side walls of the carton are wiped up against the sides of the plunger head as it descends, the distortable portions *g* will be pressed outward thus opening the slits *f* of the corner locks so that, as the carton end walls are wiped upward by the die members 10, and their end flaps *h* carrying the tongues or hooks *j* are folded inwardly into contact with the carton side walls, the tongues or hooks *j* will be inserted through the slits *f* behind the distorted portions *g* and also behind the wings 24, thus lying within the recesses or grooves 21 (Fig. 10). After the plunger head has completed its descent and has started its ascent, and the upper edges of the carton side walls are engaged by the shoulders or stops 8, the erected and locked carton will be stripped from the plunger head. During this stripping action the inturned lips 25 on the wings 24 of the corner lock guiding and associating means will come

into play. As stated, the tongues or hooks *j* are inserted behind the wings **24** and hence between these wings and the outer faces of the recesses or grooves **21** which are overlain by the side walls *d* of the carton.

Therefore, as relative movement between the set-up carton and the plunger head takes place during the stripping operation which removes the carton from the plunger head, the lips **25** as they pass over the tongues or hooks *j* will bend the latter inwardly of the carton and thus insure the proper interlocking engagement of the upper edges of the tongues or hooks with the downwardly facing edges of the slits *f*, as shown in the left-hand rear portion of Fig. 8.

Having reference to Figs. 1 to 3, it will be noted that the members **12** which serve to wipingly fold in the end flaps *h* of the carton end walls have, due to their freely rotative, or rotatively driven, character, an advantage over somewhat similarly shaped but fixed means for the same purpose, in that their ability to rotate, or their imparted rotation, serves to eliminate any appreciable drag upon the flaps *h* and hence greatly reduces the tendency for the flaps to be buckled upon or adjacent to their folding scores *i* or to tear at such points.

In view of the certainty of interlock of the slit and tongue or hook corner lock means of the erected cartons as accomplished by the guiding and associating means of the invention, it will readily be appreciated that the normal losses in cartons scrapped because they have not had their corner locks properly associated will be overcome. Moreover, this certainty of proper erection makes unnecessary the rigid inspection of erected cartons coming from the machine and thus increases production and the facility of maintenance of an adequate and continuous supply of erected cartons at production line carton filling stations.

Also, due to the provision of the improved rotatable end wall flap folding means, whereby crushing and tearing of the carton blanks are overcome, further assurance of proper erection of the cartons is obtained, and losses due to necessary scrapping of damaged cartons is avoided.

Various changes and modifications are considered to be within the principle of the invention and the scope of the following claims.

What is claimed is:

1. In mechanism of cooperating plunger and die type for erecting corner lock cartons in which mating portions of the side and end walls at a corner are provided with cooperating interengageable slit and hook means, respectively, the combination with said plunger of means for distorting the carton side wall adjacent to said slit means to open said slit means for the reception of the hook means and to confine said hook means with relation to the said side wall, comprising a wing member affixed to the side of said plunger and having a free edge portion laterally outwardly offstanding from the plane of said plunger side, said wing member having lip means inwardly offset from its free edge portion adjacent to the bottom of the plunger and terminating in proximity to said plunger side, whereby said wing member is adapted to receive the hook means between it and the plunger side and inwardly of the carton side wall after insertion of the hook means through the slit means of said carton side wall, and the lip means being normally located below said hook means will serve upon stripping of the erected carton from the plunger to engage with and spring the hook means further inwardly of the carton side wall to insure its engagement with a complemental edge of the slit means.

2. Mechanism as claimed in claim 1, in which the plunger side is provided with a recess in substantial alignment with said wing member, said recess serving to accommodate the inserted hook means laterally inwardly of said wing member.

3. Mechanism as claimed in claim 2, in which the lip means of said wing member extends into said recess.

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