

Dec. 18, 1962

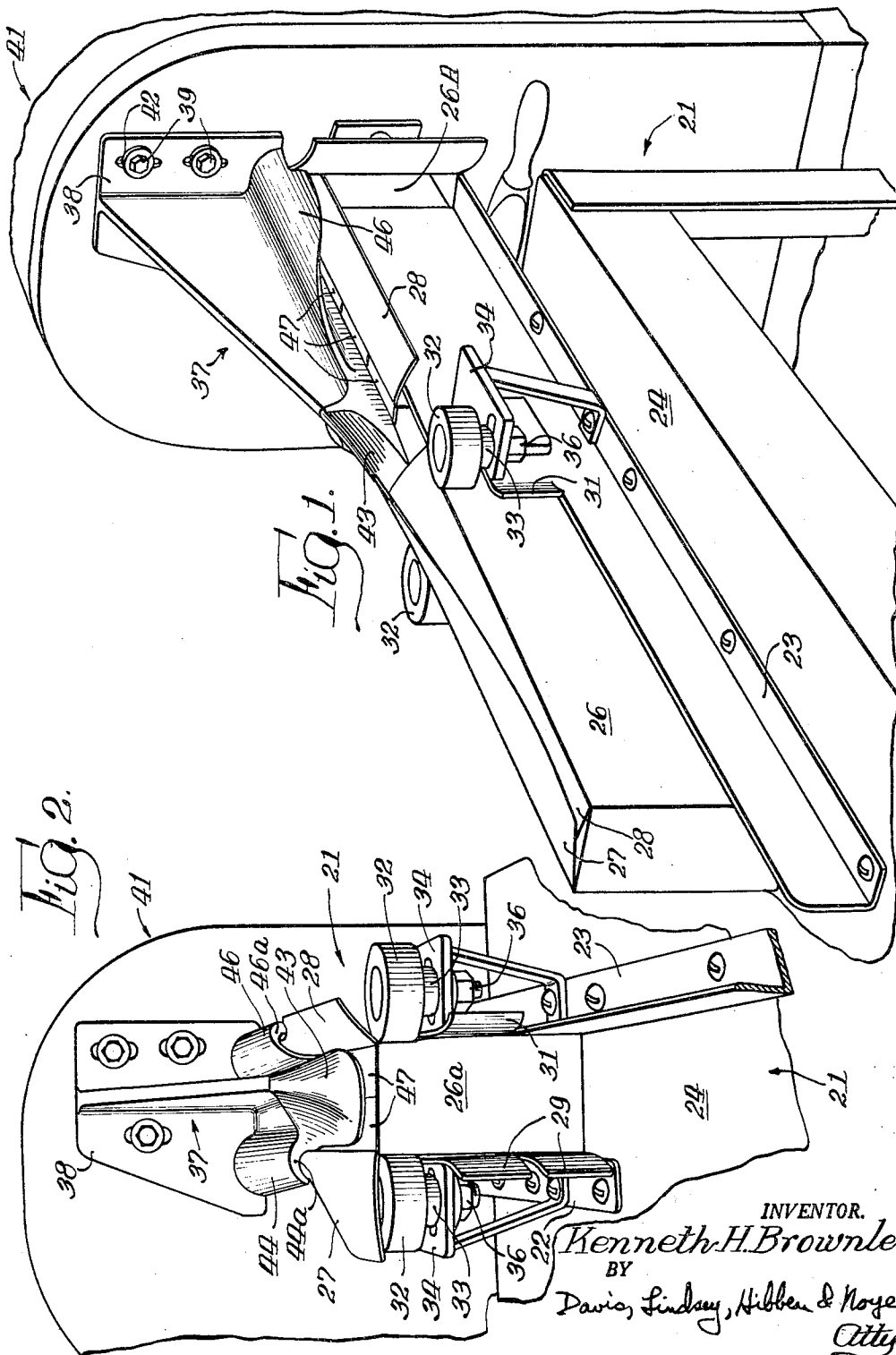
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3,068,622

CARTON OPENING MACHINE AND METHOD

Filed Oct. 19, 1959

4 Sheets-Sheet 1



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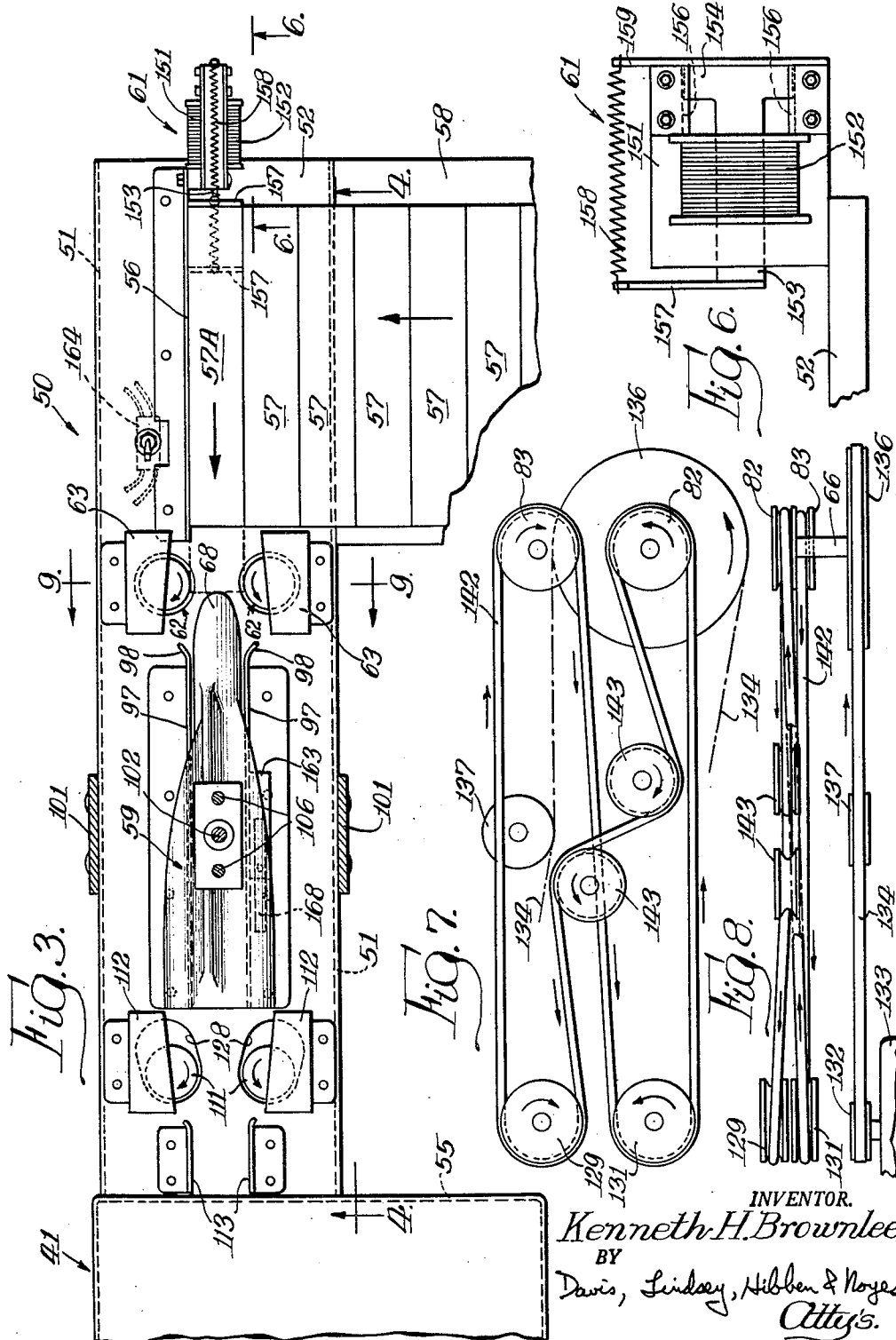
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CARTON OPENING MACHINE AND METHOD

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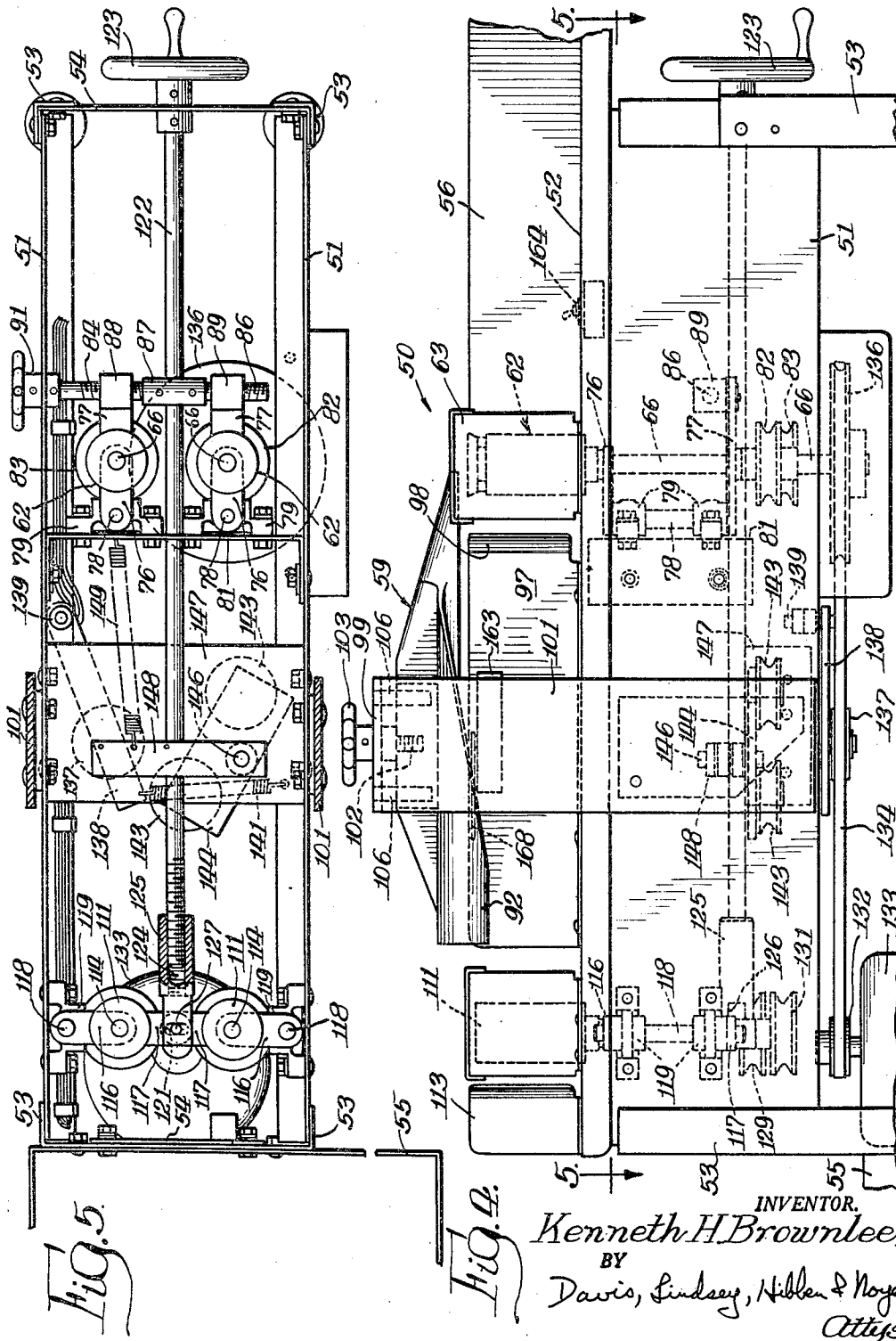
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CARTON OPENING MACHINE AND METHOD

Filed Oct. 19, 1959

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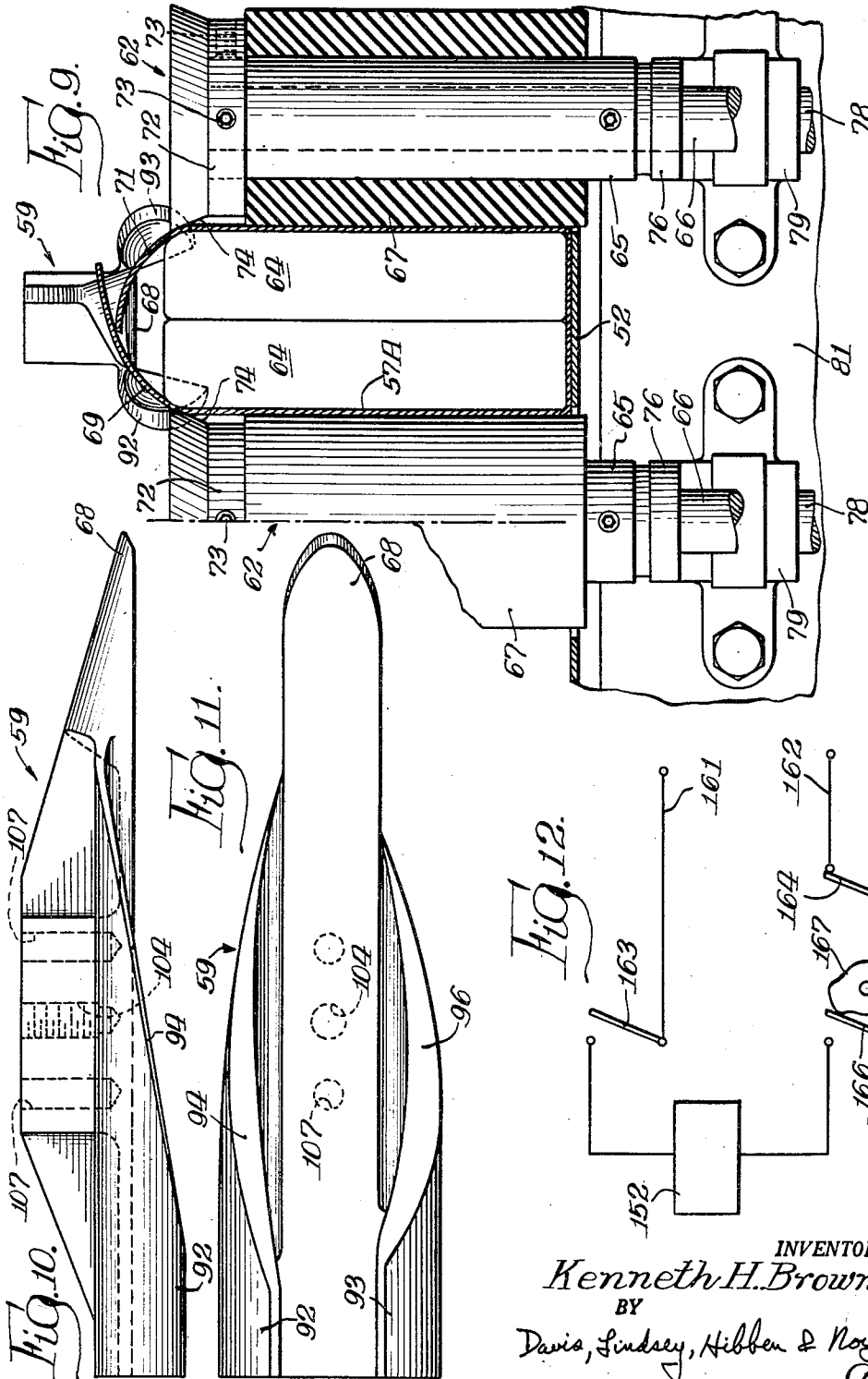
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CARTON OPENING MACHINE AND METHOD

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4 Sheets-Sheet 4



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3,068,622

CARTON OPENING MACHINE AND METHOD
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cord Co., Chicago, Ill., a corporation of Illinois
Filed Oct. 19, 1959, Ser. No. 847,276
19 Claims. (Cl. 53—50)

This invention relates to a novel carton opening machine and method and more particularly to a device and method for opening cigarette cartons to dispose the ends of the cigarette packages contained therein so that tax stamps or the like may be affixed to the packages.

As an incident to the distribution of cartons of cigarettes to retail dealers, many states or municipalities require that tax stamps be affixed to the packages of cigarettes before the cigarettes are sold at retail. Consequently, the wholesale distributor of the cigarettes is required to open the sealed cartons and affix tax stamps to the individual packages before distribution to the retail dealers. To expedite this procedure, various machines have been developed to effect detachment of the glued flaps of the carton and folding back of the freed flaps by appropriate flap folding mechanism to expose the ends of the cigarette packages in the carton. Tax stamps are then affixed to the exposed ends of the cigarette packages and the loosened flaps are folded back into their original position and thereafter glued closed.

The present invention is directed to the carton opening phase of the aforementioned sequence of operations and is embodied in a novel device and method which, although having manual utility, are particularly adapted for use in conjunction with an automatic tax stamp applying machine of the type shown in my U.S. Patent No. 3,001,310, issued September 26, 1961. In particular, the invention provides a combined carton feeding and carton opening device for supplying open cartons in proper timed relation to a tax stamp applying mechanism. In connection with an automatic tax stamp applying machine operating at high speed, it is desirable to avoid operation of the stamp applying mechanism in case an unopened carton is inadvertently introduced to the machine. Otherwise, the tax stamps will be wasted by being affixed to the exterior of the closed carton and reprocessing of the package will be necessary. The present invention also provides a solution to this problem.

Accordingly, a primary object of the invention is to provide a novel and improved carton opening device.

A more specific object of the invention is to provide a novel and improved carton opening device which is particularly adapted for high speed automatic operation.

A further object of the invention is to provide a novel and improved machine for automatically opening cartons and feeding the open cartons to a subsequent operation, such as a tax stamp applying operation.

Another object of the invention is to provide novel means for controlling the feeding of cartons to an opening device so as to avoid discharge of an unopened or incompletely opened carton from the opening device.

An additional object of the invention is to provide a novel combination of a carton feeding device, a carton opener, a stamp applying mechanism, and control means for actuating the feeding device in predetermined timed relation with the operation of the stamp applying mechanism.

Another object of the invention is to provide, in the aforementioned combination, novel means for detecting an unopened or improperly opened carton and preventing passage of the same from the opener to the stamp applying mechanism.

Still another object of the invention is to provide a novel and improved method for opening a carton.

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Other objects and advantages of the invention will be apparent from the following detailed description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view showing a manually operated embodiment of the invention;

FIG. 2 is a fragmentary perspective view further illustrating the embodiment of FIG. 1;

FIG. 3 is a top plan view of a preferred automatic embodiment of the invention;

FIG. 4 is a side elevational view as seen substantially along the line 4—4 of FIG. 3 with portions of the device omitted for clarity;

FIG. 5 is a top plan view of the device with a portion thereof removed, as seen substantially along the line 5—5 of FIG. 4;

FIG. 6 is an enlarged scale elevational view of a portion of the device as seen along the line 6—6 of FIG. 3;

FIG. 7 is a top plan and partially schematic view of the driving arrangement for the machine;

FIG. 8 is a side elevational view of the driving arrangement shown in FIG. 7;

FIG. 9 is an enlarged vertical sectional view as seen along the line 9—9 of FIG. 3 with a carton in a more advanced stage of processing;

FIG. 10 is an enlarged side elevational view of one element of the machine;

FIG. 11 is a bottom plan view of the element shown in FIG. 10; and

FIG. 12 is a schematic circuit diagram illustrating certain control features of the invention.

Referring first to FIGS. 1 and 2, one form of the invention is illustrated wherein the carton opening device is adapted for manual operation, i.e., the cartons are fed through the opening device by hand. The carton opener, indicated generally at 21, comprises a pair of angle members 22 and 23 mounted in parallel spaced relation on a table or support 24 so as to provide an elongated open chute or guideway between the upright walls of the angle members. In this instance, the angle member 22 is shorter than the angle member 23 so that cigarette cartons can be fed laterally toward the angle 23 for aligning successive cartons longitudinally with the chute. As seen in FIG. 1, a cigarette carton 26 having a foldable upper end wall or flap 27 and an underlying tuck flap 28 is inserted longitudinally at the inlet of the chute, the upright walls of the angles 22 and 23 having outwardly diverging end portions 29 and 31, respectively, for facilitating entry of the carton into the chute. As fed to the opener, the flaps 27 and 28 of the carton are secured together by glue or other adhesive.

Adjacent the inlet end of the chute at the upper portion thereof a pair of opposed rollers 32 are mounted so as to engage the opposite longitudinal side walls of the carton 26. The rollers 32 are mounted for free rotary movement on a pair of upright studs or axles 33 which are disposed in slotted brackets or shelf portions 34 extending laterally from the side walls of the chute. The roller assemblies 32—33 are adjusted in predetermined spaced relation and rigidly secured in said relation, as by nuts 36 secured to the lower ends of the studs 33.

The lateral spacing between the rollers 32 is adjusted so as to be slightly less than the width of the carton 26 so that a lateral squeezing action or compression effect is exerted on the upper portion of the carton 26 as the carton is forced manually between the rollers 32. As a result of this lateral squeezing action by application of pressure to the opposed side walls of the carton adjacent the upper longitudinal top wall thereof, the side walls of the carton yield inwardly to a slight extent and the top wall of the carton, comprising the superimposed and adhesively secured flaps 27 and 28, assumes an upwardly bulged contour. The upward bulging of the top wall of

the carton creates an enlarged end space for receiving the operating end of a generally wedge-shaped horn or opening element 37. The horn 37 is rigidly mounted above the chute by means of an integral flanged bracket portion 38 which is secured by screws 39 to the adjacent end wall of the outer casing of an automatic transfer or tax stamp applying machine designated generally at 41 and disposed immediately adjacent the carton opening device 21. In particular the tax stamp applying machine 41 may be of the type illustrated in my aforementioned U.S. Patent No. 3,001,310. Preferably, the bracket 38 is slotted, as at 42, to permit vertical adjustment of the horn 37 whereby the outer end of the horn may be disposed at the proper elevation dependent upon the height of the carton.

The outermost end portion 43 of the horn has a generally wedge-shaped configuration with a smooth taper longitudinally of the horn and a transverse taper extending in opposite directions from a thick middle portion. The transversely tapered portions are generally non-symmetrical with respect to the longitudinal axis of the horn. As the carton 26 is forced manually against the wedge-shaped end 43 of the horn 37, the flaps 27 and 28 are forced upwardly and the glued connection therebetween is disrupted. Although the top cover flap 27 is wider than the underlying tuck flap 28, effective spreading force is imparted to both of the flaps by reason of the aforementioned non-symmetrical contour of the tapered end portion 43 of the horn. This is perhaps best seen in FIG. 2 which illustrates a carton 26 in a more advanced stage of the opening process and from which it will be seen that the laterally or transversely tapered surface at the left side of the horn portion 43 is relatively wide for coaction with the wider flap 27 at the left side of the carton 26, whereas the laterally or transversely tapered surface at the right side of the horn portion 43 is relatively narrow for coaction with the narrower flap 28 at the right side of the carton 26. As the flaps 27 and 28 are bulged upwardly and disconnected, they are likewise forced outwardly by the continued camming action of the tapered horn portion 43. Continued movement of the carton 26 in the direction of the horn causes the outwardly moving flaps 27 and 28 to be engaged by a pair of elongated integral downwardly curved side edge portions 44 and 46 which merge into the horn portion 43 through smoothly curved and rearwardly sloping cam edges 44a and 46a. As the carton moves against the horn 37, the cam edges 44a—46a and the downwardly curled portions 44—46 cause the flaps 27 and 28, respectively, to be opened completely and forced downwardly against the outside walls of the carton 26 so as to expose the upper ends of a plurality of cigarette packages 47 contained in the carton.

Each succeeding carton is moved forwardly into the tax stamp applying machine 41 by the action of a succeeding carton pressed thereagainst in end-to-end relation. As seen in FIG. 1, a carton 26a with its flaps 27 and 28 completely open is in position to enter the inlet of the tax stamp applying machine from which it will be automatically conveyed by suitable feed means (not shown), and the succeeding carton 26 is in the process of being forced onto the tapered end 43 of the horn and will eventually make endwise engagement with the already opened carton so as to complete the feeding of the latter into the tax stamp machine 41.

In FIGS. 3 to 12 a more elaborate and preferred embodiment of the invention is illustrated wherein the carton opening device is also provided with automatic means for feeding successive cartons through the opening device into the tax stamp applying machine with a minimum degree of manual operation.

Referring particularly to FIGS. 3 to 5 and 9, the carton opening device is designated generally at 50 and includes a supporting table having side walls 51, a top portion 52, legs 53, end walls 54, and an end mounting bracket 55 for securing the discharge end of the opening device to

the inlet end of a tax stamp applying machine (not shown) which may be of the automatic type heretofore referred to in connection with FIGS. 1 and 2. At the right-hand or inlet end of the carton opening device, as viewed in FIGS. 3 to 5, an angle member is rigidly mounted on the table top 52 to provide an upright carton guide wall 56. A plurality of cigarette cartons 57 may be arranged in side-to-side relation along a lateral extension 58 of the table top 52 for disposing successive cartons against the guide wall 56 in longitudinal and aligned relation with an opening horn or shoe 59. A reciprocable pusher or feeder 61, hereinafter described in greater detail, is mounted on the table top 52 for intermittent feeding of the cartons. As indicated in dotted lines in FIG. 3, a carton 57A disposed against the guide wall 56 has been moved to the left by the action of the feeder 61 and the left-hand end of the carton is thereby introduced between a pair of driven feed rollers 62 which are partially enclosed by guards 63 and are arranged for rotation in the directions indicated by the arrows.

As more clearly seen in FIG. 9, the rollers 62 are mounted in upright spaced relation at opposite sides of the carton 57A containing cigarette packages 64. Each roller 62 comprises a tubular core 65 rigidly affixed to an upright shaft 66 and surrounded by a concentric sleeve 67 of rubber or like material for frictionally gripping the side wall of the carton 57A. Thus, once the end of the carton 57A is inserted between the driven rollers 62, the carton is automatically projected through the rollers for effecting insertion of the tapered outer end portion 68 of the horn 59 beneath the superimposed flaps 69 and 71 at the top of the carton. To facilitate insertion of the end 68 of the horn 59 into the end of the carton, the feed rollers 62 are spaced so as to exert the same type of squeezing or compression action against the sides of the carton as was previously described in connection with FIGS. 1 and 2 and thereby causing upward bulging of the flaps 69 and 71.

To avoid excessive wear in the rubber sleeves 67, the upper end of each roller 62 is provided with a metal collar 72 rigidly affixed to the shaft 66, as by set screws 73, and overlying the upper axial end of the rubber sleeve 67. Preferably, these upper end collars 72 are formed with tapered or flared annular shoulder portions 74 which are arranged to engage the carton 57A along the upper longitudinal corner edges thereof, as best seen in FIG. 9. The angle of the shoulder 74 is not particularly critical but good results have been obtained with an angle of from about 20° to about 25° from the vertical. The engagement of the sloping annular shoulders 74 with the opposite corner edges of the carton results in a more effective upward bulging force on the carton flaps 69, 71 than would be the case where the squeezing action of the rollers is exerted entirely laterally against the sides of the carton. Furthermore, the engagement of the annular shoulders 74 with the upper corner edges of the carton exerts a slight downward retaining force on the carton as a whole so that it does not tend to be lifted upwardly from the supporting surface 52 during the opening action exerted by the horn 59. Although not perceptible in the drawings, the axes of the feed rollers 62 may also be tipped slightly toward the horn 59 and in the direction of movement of the carton to further assist in retaining the bottom of the carton in flatwise sliding engagement with the surface 52. A very slight angle of inclination on the order of about 1° is suitable for this purpose but for best results the angle should not be less than about ½° and not more than about 1½°.

Referring further to FIGS. 4, 5, and 9, the feed rollers 62 are adjustably mounted so that the lateral spacing between the rollers can be conveniently regulated to exert the desired squeezing pressure on the carton in order to obtain the required amount of upward bulging of the closure flaps of the carton. Thus, each feed roller shaft 66 is journaled in upright position between a pair of

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parallel upper and lower pivot arms 76 and 77, respectively, which extend rigidly from a pivot shaft 78. The pivot shaft 78 is journaled between a pair of upper and lower pillow block members 79 which are in turn secured to a cross plate or bracket 81 extending between the side walls 51 below the table top 52. Thus, each feed roller shaft 66 is rotatably mounted in a support 76-77-78 which is swingable about an upright axis. As best seen in FIG. 5, each swingable mounting arrangement is disposed so that a plane through the roller shaft 66 and the corresponding pivot shaft 78 extends longitudinally of the machine and substantially parallel to the longitudinal axis of the machine. The feed rollers 62 are mounted at the upper ends of the shafts 66 above the table top 52, and the lower ends of the shafts 66 projecting below the pivot arms 77 are provided with suitable pulleys 82 and 83 for driving the rollers 62, as hereinafter described in greater detail.

For adjusting the lateral spacing between the swingably mounted feed rollers 62, an adjustment device is provided comprising a pair of oppositely threaded screw sections 84 and 86 which are rigidly connected together by a collar 87. The screw sections 84 and 86 are threadedly engaged with a pair of pivot blocks 88 and 89, respectively, which are secured to the outer ends of the lower pivot arms 77. The screw section 84 extends through the adjacent side wall of the table and is provided with an adjustment knob 91 for operation of the adjustment means. By turning the knob 91 in one direction, the swingable supports for the feed rollers 62 are pivoted away from each other to increase the lateral spacing between the rollers, and by turning the knob 91 in the opposite direction the pivotal supports are moved toward each other for bringing the rollers 62 closer together.

In FIGS. 10 and 11 the horn 59 is shown in more detail. As will be evident, the horn 59 embodies the same features as the horn 37 in the first described embodiment of the invention. Thus, the horn 59 comprises an elongated unitary body having a generally wedge-shaped portion 68 at one end thereof and having oppositely spaced downwardly curled edge portions 92 and 93 at the opposite end thereof. For the reasons already discussed, the wedge-shaped end portion 68 is tapered along the longitudinal axis of the horn and is also tapered laterally in opposite directions and non-symmetrically with respect to the longitudinal axis of the horn. The downwardly curled edge portions 92 and 93 are joined to the wedge-shaped end portion 68 by smoothly curved and rearwardly sloping cam edge portions 94 and 96, respectively.

As a carton 57 is moved toward the horn 59 by the action of the feed rollers 62, the wedge-shaped end 68 of the horn enters beneath the upwardly bulged closure flaps 69, 71 and further movement of the carton into the horn results in the closure flaps being spread apart so as to disrupt the glued connection therebetween. As the carton continues to move toward the horn 59, the freed closure flaps 69, 71 are cammed outwardly by engagement with the camming edges 94, 96 of the horn, and finally the closure flaps 69, 71 are folded downwardly against the outer walls of the carton by the action of the downwardly curled edge portions 92, 93 of the horn.

On each side of the horn 59 an angle member is mounted to provide a pair of upright chute walls 97 (FIGS. 3 and 4) for guiding the movement of the carton beneath the horn. The walls 97 are flared outwardly, as at 98, at the inlet end of the chute for facilitating entry of the carton thereto as fed from the rollers 62. The horn 59 is preferably mounted for vertical adjustment so that the wedge-shaped end portion 68 can be accurately positioned with respect to the end of the carton and the bulged space created by the action of the inlet rollers. In the illustrated embodiment of the invention this vertical adjustability of the horn 59 is provided by suspending the horn from the center portion 99 (FIG. 4) of an inverted U-shaped bracket member having its leg portions 101

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fastened to the side walls 51 of the table. An adjusting screw 102 extends through the center portion 99 of the mounting bracket and has an operating knob 103 affixed to its upper end. The lower end of the screw 102 is threadedly received in a cooperating bore 104 (FIG. 10) in the upper surface of the shoe 59. A pair of depending guide pins 106 project rigidly from the bracket portion 99 and extend loosely into a pair of guide holes 107 (FIG. 10) formed in the upper surface of the horn 59 at opposite sides of the threaded bore 104. Thus, by manipulation of the knob 103 the elevation of the horn 59 can be regulated and the guide pins 106 prevent twisting of the horn 59 so as to hold it in correct longitudinal alignment during such vertical adjustment.

At the discharge end of the horn 59 a pair of driven feed rollers 111 (FIGS. 3-5) are provided for engaging the carton as it emerges from between the chute walls 97 with its closure flaps completely opened and unfolded. The discharge rollers 111 are partially enclosed by guards 112 and have generally the same construction as the feed rollers 62 shown in FIG. 9 except that in this instance the tapered annular end members are omitted since the only function of the discharge rollers is to frictionally engage the sides of the open carton and eject it into the next stage of the operation. A discharge chute is provided at the exit side of the rollers 111 by a pair of angles secured to the table top 52 and having spaced upright wall portions 113. It will be understood that the carton with its closure flaps opened and unfolded to expose the tops of the cigarette packages 64 therein is conveyed by the action of the rollers 111 through the discharge chute 113 into the inlet of the adjacent transfer or tax stamp applying machine (not shown).

Although the discharge rollers 111 are not required to exert a squeezing or bulging pressure on the carton, as in the case of the feed rollers 62, it is nevertheless desirable to provide for lateral adjustability of the rollers 111 so as to obtain proper driving engagement of the rollers with the sides of the cartons and also to accommodate cartons of different widths. Cigarette cartons containing the so-called "flip top" or "hard" packages are not only somewhat wider than the cartons containing the so-called "soft pack" cigarette packages but they are also slightly longer. An automatic tax stamp applying machine such as previously referred to may include a stop means or the like for temporarily positioning a carton in proper stamp receiving location. Thus, the distance between the discharge rollers 111 and the mechanism of the tax stamp applying machine must be properly correlated with the length of the cartons being processed. Consequently, in order to obtain the maximum operating flexibility for accommodating different size cartons, it is desirable to provide not only for lateral adjustability of the discharge rollers 111 but also a certain degree of longitudinal adjustability so as to permit variations in the longitudinal spacing between the discharge rollers 111 and the subsequent tax stamp applying machine.

To realize this dual adjustability, the discharge rollers 111 are journaled in swingably mounted supports of the same general type as the supports heretofore described for the feed rollers 62. Thus, each roller 111 is mounted at the upper end of an upright roller shaft 114 (FIG. 5) which is in turn journaled between a pair of upper and lower pivot arms 116 and 117, respectively. The pivot arms are in turn rigidly mounted at the ends of an upright pivot shaft 118 (FIGS. 4 and 5) which is journaled in upper and lower pillow blocks 119. As best seen in FIG. 5, the pillow blocks 119 are rigidly mounted in opposed relation on the opposite side walls 51 of the table so that the roller shafts 114 and the pivot shafts 118 are aligned in substantially a common plane extending transversely with respect to the longitudinal axis of the machine. As also seen in FIG. 5, the lower pivot arms 117 of the oppositely disposed swingable roller supports 75 are disposed in overlapping relation and are provided

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with registered slots 121. An elongated adjusting screw 122 is mounted along the longitudinal axis of the machine below the table top 52 and extends at one end thereof through an end wall 54 of the table for mounting a hand wheel 123. The opposite threaded end of the screw 122 is operatively engaged with the threaded bore 124 of a clevis 125 having a slot 126 at its outer end. The overlapping end portions of the pivot arms 117 are received in the slot 126 and are connected to the clevis 125 by means of a transverse pin 127. By rotation of the hand wheel 123 in one direction the clevis 125 will be moved to the right, as viewed in FIG. 5, thereby pivoting the roller supports about the shafts 118 and increasing the lateral spacing between the rollers 111 while at the same time also increasing the longitudinal spacing between the rollers 111 and the tax stamp applying machine which would be located to the left of FIG. 5. Swinging movement of the rollers 111 is accommodated by enlarged openings 128 in the table top 52. Rotational adjustment of the hand wheel 123 in the opposite direction will cause movement of the clevis 125 to the left, as viewed in FIG. 5, thereby decreasing the lateral spacing between the rollers 111 and also decreasing the longitudinal spacing between the rollers 111 and the tax stamp applying machine. Just as in the case of the feed rollers 62, the depending shafts 118 for the discharge rollers 111 are also provided at their lower ends with suitable pulleys 129 and 131 for driving the rollers.

Although any suitable driving arrangement for the rollers 62 and 111 may be provided, I have shown in FIGS. 4, 7 and 8 a common belt drive arrangement for both sets of rollers including means to maintain proper tension in the belt regardless of the adjusted position of the discharge rollers 111. In FIG. 5 the belt interconnecting the various roller shaft pulleys has been omitted for the sake of clarity. However, the belt arrangement is separately shown in side elevation in FIG. 8 and in top plan view in FIG. 7. Thus, a motor pulley 132 driven by a motor 133 is interconnected by a belt 134 with a main drive pulley 136. The tension in the drive belt 134 is maintained by means of an idler 137 which is mounted on a pivot arm 138 (FIGS. 4 and 5). The arm 138 has a pivotal connection 139 at a side wall 51 of the table and is connected at its free end to a tension spring 141 (FIG. 5) whereby the idler 137 is resiliently pressed against the drive belt 134. Any other suitable means for maintaining proper tension in the drive belt 134 could also be employed, e.g. the motor 133 could be adjustably mounted. The main drive pulley 136 is mounted on the lower end of the feed roller shaft 66 which also carries the feed roller pulley 82. The feed roller pulleys 82, 83 and the discharge roller pulleys 129, 131 are interconnected by a belt 142 which is trained over the pulleys in a generally "figure eight" arrangement so as to effect rotation of the feed rollers 62 and the discharge rollers 111 in the directions indicated by the arrows in FIGS. 3 and 7.

As the discharge rollers 111 are adjusted longitudinally, it will be apparent that the slack in the belt 142 will be affected. In order to maintain the desired driving tension in the belt 142 for all adjusted positions of the discharge rollers 111, a spring loaded idler arrangement is provided. In the illustrated embodiment of the invention this arrangement comprises a pair of idler pulleys 143 which are rotatably mounted on the lower side of a pivot plate 144 (FIGS. 4 and 5). The pivot plate 144 is rigidly secured to the lower end of a pivot shaft 146 which is rotatably supported in a transverse bracket plate 147 extending between the side walls 51 of the table. The upper end of the pivot shaft 146 has a lever arm 148 rigidly affixed thereto at the upper side of the bracket plate 147. A tension spring 149 extends between the outer end of the lever arm 148 and the transverse bracket plate 81 so that the lever arm 148 and its interconnected pivot plate 144 with the rotatably mounted idler pulleys

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143 are resiliently urged as a unitary assembly in a clockwise direction about the pivot axis 146 (as viewed in FIGS. 5 and 7). Thus, as seen in FIG. 7, the idler pulleys 143 engage opposite sides of the portion of the belt 142 extending between the roller pulleys 82 and 129, thereby resiliently taking up the slack in the belt 142 and maintaining a substantially constant driving tension in the belt regardless of slight variations in the longitudinal spacing between the rollers 62 and the rollers 111.

Referring now to FIG. 6, the reciprocating feeder device 61 will be described in detail. In the preferred embodiment of the invention, the feeder device is a solenoid actuated pusher comprising a frame 151 with a solenoid winding 152 and a generally T-shaped plunger or armature member 153 movably mounted relative to the frame and winding. The inner end of the plunger 153 has a transverse portion 154 slidably received at its ends in suitable grooves 156 in the frame. The outer end of the plunger 153 is provided with an upright pusher plate 157 adapted to engage the end of a carton. The solenoid plunger 153 is normally retained in retracted position (shown in FIG. 6 and in solid lines in FIG. 3) by means of a return spring 158 extending between the pusher plate 157 and an upright member 159 at the opposite end of the frame. When the solenoid coil 152 is energized, the plunger 153 is projected to the left, as viewed in FIGS. 3 and 6, so that the pusher plate 157 engages the end of a carton 57A and displaces the carton forwardly into the rotating feed rollers 62. When the solenoid coil 152 is deenergized, the plunger 153 and attached pusher plate 157 are retracted by the spring 158. Thus, by the intermittent energization and deenergization of the solenoid coil 152, the cartons 57 are fed one at a time in end-to-end relation through the carton opening machine 50. The spacing of the feeder device 61 from the feed rollers 62 is such that a single movement of the solenoid actuated pusher plate 157 is sufficient to move a single carton into engagement with the rotating feed rollers 62. Accordingly, all that the operator of the machine has to do is to maintain a supply of cartons 57 in side-by-side relation along the lateral table extension 58 and a slight manual pressure on the lateral row of cartons is sufficient to move the lead carton 57A into position between the feeder 61 and the inlet rollers 62 after each successive operation of the feeder. Suitable automatic pressure loading means could also be employed instead of manual pressure on the lateral row of cartons.

The transfer or tax stamp applying machine used in conjunction with the carton opening device of the present invention is preferably of a type which undergoes cyclic operation for applying transfers to the entire exposed contents of a single carton simultaneously. For example, the machine described in my previously mentioned U.S. Patent No. 3,001,310 is especially suitable. In a machine of the latter type, a heated platen presses a transfer-carrying web into engagement with the exposed upper ends of the cigarette packages in the open carton and simultaneously releases a plurality of tax stamps from the web and adheres them to the individual packages in a single operation. Thereafter, the platen is retracted until the next open carton has been fed into transfer-receiving position. For most efficient use of the combination of an automatic opening device of the type described herein and an automatic transfer applying machine of the type just mentioned, it is essential that the operation of the feeding device 61 be coordinated with the operation of the transfer applying machine to insure a continuous supply of opened cartons to the transfer applying machine in timed relation to the operation of the latter.

Referring to FIG. 12, the required synchronization of operation is accomplished by interposing a suitably responsive control device in the energizing circuit for the solenoid coil 152. Thus the coil 152 is connected across

a line having conductors 161 and 162. Interposed in the conductor 161 is a normally open control switch element 163 for a purpose to be described later. Interposed in the conductor 162 is a hand switch 164 which may conveniently be located on the table top 52, as seen in FIG. 3, for turning the machine "on" and "off." Also interposed in the conductor 162 is a normally open control switch 166 which is adapted to be moved to closed position by a rotary cam element 167 comprising a portion of the operating mechanism of the transfer applying machine. The cam 167 is arranged so that the switch 166 is closed at a predetermined time in the operating cycle of the transfer applying mechanism, preferably shortly before the end of the operating cycle. Thus, assuming that switches 163 and 164 are also closed, the switch 166 will be closed just before the completion of a transfer applying operation thereby energizing the feeder 61 to project another carton through the opening device whereby to make available a previously opened carton for the next cycle of operation of the transfer applying machine.

The switch element 163 referred to above is mounted adjacent the horn 59 in a suitable location so that it will be engaged by a properly opened closure flap. As best seen in FIGS. 3 and 4, the switch 163 may be mounted on one of the chute walls 97 and the switch mechanism preferably has an elongated sensitive finger or operating element 168 which may extend longitudinally into one of the downwardly curved edge portions 92 of the horn. The distance between the rollers 62 and the rollers 111 is somewhat greater than the length of a carton so that as a given carton is received by the rollers 62 from the feeder 61 it will be projected into operative relation with the horn 59 but will not be engaged by the discharge rollers 111. Thus, the carton comes to a brief stop at the horn 59 and does not move into engagement with the rollers 111 until the next carton fed by the feeder 61 and the rollers 62 pushes it ahead.

Since the switches 163 and 166 are connected in series with the solenoid coil 152, both switches must be closed before the feeder 61 can be actuated. When the cam mechanism 167 of the transfer applying machine closes the switch 166, the feeder 61 will operate provided that the preceding carton which is in a temporary stationary position beneath the horn 59 has been properly opened so that one of the opened and outwardly folded closure flaps engages the sensitive operating finger 168 of the switch 163 to maintain the latter also in closed position. However, if for some reason a carton has not been properly opened by the horn 59, the switch 163 will not be closed and the next subsequent closure of the switch 166 by the transfer machine cam element 167 will not cause operation of the feeder 61. Upon observing this condition, the operator of the machine can then shut off the machine by means of the hand switch 164, remove the improperly processed carton, and make any necessary adjustments in the mechanism before restoring the machine to operation. This control arrangement whereby the reciprocable feeder 61 is operative only when a preceding carton has been properly opened prevents damage to the cartons and their contents and also prevents inadvertent passage of an unopened carton through the transfer applying machine so as to avoid costly delays and waste of tax stamps. Preferably, the switch 163 is located on the side of the horn 59 corresponding to the side of the carton carrying the lowermost or innermost of the overlapping closure flaps. In this way the control switch will readily detect an unopened or improperly opened carton regardless of whether one or both closure flaps remain unopened.

Although the invention has been described with reference to certain specific structural embodiments thereof, it will be understood that various modifications and equivalents may be resorted to without departing from

the scope of the invention as defined in the appended claims.

I claim:

1. A device for opening cartons with overlapping adhered closure flaps comprising a wedge opening member having a tapered end portion adapted to enter beneath the closure flaps of a moving carton at one end thereof, guide means for directing one end of the moving carton onto the tapered end portion of said opening member, a pair of rollers disposed in laterally spaced relation at opposite sides of said tapered end portion and having an axial length sufficient to engage opposite walls of the carton across substantially the entire extent of said walls, means adjustably supporting said rollers for regulating the lateral spacing therebetween in accordance with the carton dimensions so as to exert lateral squeezing pressure on the carton walls thereby causing upward bulging of said closure flaps and creating an enlarged space at the end of the carton for facilitating entry of said tapered end portion beneath said flaps, and driving means connected to said rollers for rotating the same, said rollers being provided with frictional gripping surfaces for moving the carton toward said opening member.

2. In a carton opening device the combination of a tapered opening member adapted to be inserted beneath the closure flaps of a moving carton at one end thereof, a pair of rollable elements mounted on laterally spaced up-right axes at opposite sides of said tapered opening member and having an axial length sufficient to engage the opposite side walls of the carton under squeezing pressure across substantially the entire extent of said walls whereby to cause upward bulging of the closure flaps and thereby creating an enlarged space at the end of the carton for facilitating entry of the tapered opening member beneath said flaps, means adjustably supporting said elements for regulating the lateral spacing between said axes, and driving means connected to said elements for rotating same, said elements being provided with frictional gripping surfaces for moving the carton toward said opening member.

3. In a carton opening device for use with cartons having overlapping adhered closure flaps, a combined flap releasing and unfolding member comprising an elongated body having at one end thereof a generally wedge shaped longitudinally tapered blade portion within a thin forward extremity adapted to enter beneath the closure flaps at one end of a moving carton and increasing in thickness rearwardly for disrupting the adhered connection between the closure flaps, and a pair of sloping, downwardly curled, laterally spaced edge portions at the opposite end of said body adapted to engage the freed closure flaps of the carton for camming the flaps outwardly and downwardly during movement of the carton, said blade portion also being tapered in thickness in opposite directions laterally and non-symmetrically with respect to the longitudinal axis of said body whereby to coact with a pair of superimposed closure flaps having different widths.

4. The structure of claim 3 further characterized in that said body is also provided with means for supporting the same in vertically adjustable relation.

5. In combination, a casing adapted to enclose a transfer applying means, said casing having an inlet opening for receiving cartons, a chute extending outwardly from said inlet opening for guiding cartons thereto, a wedge opener comprising an elongated tapered member rigidly mounted on said casing and extending longitudinally above said chute and adapted to enter one end of a moving carton beneath the closure flaps thereof, a pair of rollers mounted at opposite sides of said chute adjacent the outer end of said opener, and means adjustably supporting said rollers for regulating the lateral spacing therebetween in accordance with the carton dimensions so as to engage and apply squeezing pressure to the opposite side walls of the carton at said one end thereof whereby to cause upward bulging

of the closure flaps of the carton thereby creating an enlarged space to facilitate entry of said opener.

6. A device for opening cartons with overlapping adhered closure flaps, comprising a wedge opening member having a tapered end portion adapted to enter beneath the closure flaps of a moving carton at one end thereof, guide means for directing one end of the moving carton onto the tapered end portion of said opening member, a pair of upright shafts disposed with their upper ends at opposite sides of said tapered end portion, drive means connected to said shafts below the upper ends thereof for rotating the shafts, a pair of rollers secured to said upper ends of said shafts for frictionally engaging the opposite side walls of a carton to move the latter toward said opening member, support means swingably supporting said shafts for movement away from and toward each other whereby the spacing between said rollers is adjustable, and adjusting means connected to said support means for regulating the roller spacing to apply sufficient squeezing pressure to the opposite side walls of the carton so that the closure flaps are bulged upwardly thereby creating an enlarged space at one end of the carton to facilitate entry of said opening member.

7. A device for opening cartons with overlapping adhered closure flaps, comprising elongated chute means having an inlet end and an outlet end and adapted to have cartons moved successively therethrough, a pair of driven inlet rollers disposed at opposite sides of said chute means at the inlet end thereof for frictionally engaging the opposite side walls of a carton and moving the same into said chute means, a pair of driven outlet rollers disposed at opposite sides of said chute means at the outlet end thereof for frictionally engaging the carton and discharging the same from the chute means, and elongated carton opening means mounted above said chute means between said inlet rollers and said outlet rollers and having a tapered end portion extending toward the inlet end of said chute means for entering beneath the closure flaps at one end of a carton moving through the chute means, said inlet rollers being spaced closely enough together to exert a squeezing pressure on the sides of the carton whereby to cause upward bulging of the closure flaps and thereby creating an enlarged space at the end of the carton to facilitate entry of the tapered end portion of said opening means beneath the closure flaps.

8. The device of claim 7 further characterized in that said inlet rollers are mounted for adjustable movement away from and toward each other for regulating the lateral spacing therebetween and said outlet rollers are mounted for combined adjustable movement away from and toward each other and also longitudinally relative to said chute means.

9. The device of claim 7 further characterized in that said inlet rollers and said outlet rollers are mounted on upright driven shafts which are each journaled in pivotally supported adjustable bracket means, the bracket pivot axis and the shaft axis of each of said inlet rollers being disposed in a plane extending substantially parallel to the longitudinal axis of said chute means, and the bracket pivot axis and the shaft axis of each of said outlet rollers being disposed in a plane extending substantially transversely of said chute means.

10. The device of claim 7 further characterized in that said carton opening means is also provided with means for supporting the same in vertically adjustable relation to said chute means.

11. In a carton opening device, the combination of elongated chute means adapted to have a carton moved therethrough, carton opening means mounted above said chute means and having a tapered end portion adapted to enter beneath the closure flaps at one end of a moving carton, and a pair of driven rollers mounted at opposite sides of said chute means adjacent said tapered end portion for frictionally engaging the opposite side walls of a carton and moving the carton through the chute

means, said rollers having inwardly tapered annular portions at their upper ends adapted to engage the upper longitudinal corner edges of a carton, and the spacing between said rollers being sufficiently close that said tapered annular portions of said rollers exert an angularly directed squeezing pressure against said corner edges of the carton thereby bulging the carton closure flaps upwardly and creating an enlarged space at the end of the carton for facilitating entry of said tapered end portion of the opening means beneath said flaps.

12. In a device for opening a carton having overlying adhered closure flaps, a pair of spaced driven rollers frictionally engageable with opposite side walls of a carton for moving the same through the opening device, said rollers having inwardly tapered annular portions at their upper ends adapted to engage the upper longitudinal corner edges of a carton and the spacing between said rollers being sufficiently close that said tapered annular portions of said rollers exert an angularly directed squeezing pressure against said corner edges of the carton thereby bulging the carton closure flaps upwardly and creating an enlarged space at the end of the carton for facilitating entry of an opening element beneath said flaps.

13. In a device for opening a carton having overlying adhered closure flaps, the combination of wedge opening means having a tapered end portion adapted to enter beneath the closure flaps at one end of a moving carton, a pair of spaced driven rollers at opposite sides of said tapered end portion for frictionally engaging the side walls of a carton and moving the same toward said opening means, and reciprocable feeder means spaced from said rollers and adapted to engage the ends of successively positioned cartons for feeding the same one at a time into said rollers.

14. In a device for opening a carton having overlying adhered closure flaps, the combination of wedge opening means having a tapered end portion adapted to enter beneath the closure flaps at one end of a moving carton, a pair of spaced driven rollers at opposite sides of said tapered end portion for frictionally engaging the side walls of a carton and moving the same toward said opening means, reciprocable feeder means spaced from said rollers and adapted to engage the ends of successively positioned cartons for feeding the same one at a time into said rollers, and control means including a control element at said opening means adapted to be engaged by an opened closure flap for permitting operation of said feeder means to feed a succeeding carton into said rollers only when the preceding carton has been properly opened.

15. The combination of claim 14 further characterized in that said feeder means comprises a solenoid actuating means and said control element comprises a normally open switch element connected in the energizing circuit for the solenoid actuating means, said switch element being closable by engagement with an opened closure flap.

16. For use with a means for applying transfers to a plurality of articles in a carton, the combination of means for opening cartons to expose the articles therein, roller means frictionally engageable with the cartons for moving the same through said opening means and adapted to move the opened cartons into the transfer applying means, reciprocable feeder means spaced from said roller means and adapted to engage the ends of successively positioned cartons for feeding the same one at a time into said roller means, and control means adapted to actuate said feeder means in predetermined timed relation to the operation of the transfer applying means.

17. For use with a means for applying transfers to a plurality of articles in a carton, the combination of wedge opening means having a tapered end portion adapted to enter beneath the closure flaps at one end of a moving

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carton, a pair of spaced driven rollers at opposite sides of said tapered end portion for frictionally engaging the side walls of a carton and moving the same toward said opening means, reciprocable feeder means spaced from said rollers and adapted to engage the ends of successively positioned cartons for feeding the same one at a time into said rollers, first control means adapted to actuate said feeder means in predetermined timed relation to the operation of the transfer applying means, and second control means including a control element at said opening means adapted to be engaged by an opened closure flap for permitting operation of said feeder means to feed a succeeding carton into said rollers only when the preceding carton has been properly opened.

18. The combination of claim 17 further characterized in that said feeder means comprises a solenoid actuating

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means, said first control means including a normally open switch element connected in the energizing circuit for said solenoid actuating means, and said control element of said second control means comprising a normally open switch element connected in said energizing circuit and closable by engagement with an opened closure flap.

19. The device of claim 1 further characterized in that said rollers are mounted on generally upright axes which are inclined slightly toward said opening member, the angle of inclination being from about $\frac{1}{2}^{\circ}$ to about $1\frac{1}{2}^{\circ}$.

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